

NOTES.

Connecticut State Station.—G. L. Davis, assistant chemist since 1913, terminated his work at this station in June.

Iowa College.—George W. Iverson, instructor in agricultural engineering, has resigned to become farm-engineering editor of a chain of agricultural publications.

Kansas College and Station.—The honorary degree of LL. D. was bestowed upon President H. J. Waters by the University of Missouri at its recent commencement.

Dr. C. M. Brink, professor of English literature and dean emeritus of the college, died June 29. He had been with the institution since 1902 and served as dean of the college from 1909 until his recent retirement.

W. A. Lippincott, poultry husbandman, has been given a year's leave of absence for graduate work in genetics at the University of Wisconsin.

In the extension division, Miss Minnie Sequist has been appointed specialist in home economics and Miss Mary Wright specialist in domestic arts, both appointments beginning September 1. R. P. Schnacke and F. B. Williams have been appointed county agents for Pawnee and Marshall counties, respectively, and have entered upon their duties. Including the 16 county agents and 5 district agents at work in the State, there are now 42 men and 6 women devoting full time to the extension work of the college. A conference of the members of the division of extension was held at the college June 12-17 for the discussion of organization, policies, and relationship between county and district agents, extension specialists, and specialists of the division of agriculture.

Minnesota University and Station.—Dr. R. A. Gortner, associate professor of soil chemistry, has been transferred to the division of agricultural biochemistry with the title of associate professor of agricultural biochemistry and in charge of the section of biochemical research.

Missouri Station.—Henry Cohn has succeeded C. E. Deardorff, resigned, as assistant in the soil survey. A. F. Ridgway has been appointed assistant in veterinary science.

Nebraska University and Station.—Dr. Raymond J. Pool has been appointed permanent head of the department of botany. C. A. Helm, instructor and assistant in experimental agronomy, has resigned to become assistant professor of agronomy in the University of Missouri. William Rabak has been appointed instructor in agricultural chemistry and assistant in agricultural chemistry in the station.

New Jersey Stations.—Samuel U. Hodgeson and Joseph J. Williams have resigned as assistant chemists. Louis J. Kleinfeld and D. James Kay have been appointed assistant chemists; H. C. Haines, assistant extension specialist in fruit growing; Miss E. P. Leeds, assistant State leader of girl's club work; and David Schmidt, field assistant in horticulture.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Chief, Office of Experiment Stations.*
Assistant Editor: H. L. KNIGHT.

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Agricultural Botany, Bacteriology, and Plant Pathology {W. H. EVANS, Ph. D.
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As the years go by, the annual acts making appropriations for the support of the Federal Department of Agriculture are coming to be recognized more and more as of wide public interest. They serve to epitomize the development and progress of the Department and to emphasize its intimate relations with the daily life of the whole American people. They constitute the medium in which provision is made from time to time for new and enlarged activities, as in the development of demonstration work and the prosecution of marketing studies. Quite frequently they embody important pieces of legislation, as in the meat-inspection amendment of 1906, the Nelson amendment of 1907 increasing the appropriations to the agricultural colleges, and the virus-serum-toxin and the migratory-bird provisions of the act of 1913.

The latest of these acts, covering the fiscal year ending June 30, 1917, is fully as important and interesting in these respects as any of its predecessors. It considerably extends and enlarges the functions and activities of the Department and establishes a new high-water mark in the appropriations for its maintenance. Among other provisions it materially increases the funds available for marketing studies, the eradication of the cattle tick in the South, the combating of rabies in the Rocky Mountain States, and the farmers' cooperative demonstration work outside the cotton belt, as well as for most of the regulatory services of the Department. It inaugurates a market news service and includes, as a new item, studies and demonstrations of methods for obtaining potash on a commercial scale. It provides for the expenditure of \$3,000,000 for additional purchases of lands in the White Mountains and the southern Appalachian system for development as National Forests. It repeals the United States Cotton-Futures Act of 1914 and substitutes a modification of that measure, and it embodies, among other new legislation, provisions to be known as the United States Grain-Standards Act and the United States Warehouse Act.

The new law was introduced into the House of Representatives March 4, following hearings extending over a period of nearly six weeks. As usual, many of its provisions received detailed considera-

tion from Congress, and it did not finally become law until August 11. During the interval which followed the termination of the preceding fiscal year on June 30 the maintenance of the Department was provided for by the passage of special acts extending the appropriations, under certain restrictions, on the basis of the act for the previous year.

The appropriations carried in the new act aggregate \$26,948,852. This is an increase of \$2,349,763 over the estimates submitted by the Department and an increase of \$3,977,070 over the amount carried in the act for the previous year. If comparison between the two fiscal years 1916 and 1917 is attempted, however, an addition should be made to the appropriations for the former year of deficiency items aggregating \$395,000, and a deduction of \$2,000,000 made from those carried by the new act, since this sum, provided for forest reserve purchases, is not available until the following year. On this basis the increase becomes \$1,582,070.

Considering the allotments to the various Bureaus, the Weather Bureau receives \$1,747,260. This is an increase of \$81,210, of which \$40,000 is for the extension of the weather service to the Caribbean Sea region, the Panama Canal Zone, and Alaska. It also includes \$10,000 for an extension of the frost-warning and river and flood control work and \$22,500 for the erection of a building at Cape Henry, Virginia.

The appropriations directly allotted to the Bureau of Animal Industry aggregate \$3,020,746, but this is supplemented by extensive funds provided elsewhere. The total corresponding allotments for the previous year were \$2,585,336, so that the increase granted is considerable.

The inspection and quarantine work of the Bureau against animal diseases receives \$532,780, a decrease of \$75,000, due to the reduced area under quarantine for sheep and cattle scabies. For pathological studies of animal diseases \$138,020 is granted, of which \$50,000 is a new item authorizing work on contagious abortion.

For the tick-eradication campaign an appropriation of \$632,400 is given, and it is expected that this will be supplemented by State and county funds sufficient to make a total of nearly \$1,000,000. Of this amount \$50,000 may again be used for live-stock and dairy demonstration work in cooperation with the States Relations Service in areas freed of ticks. During the past year 49,629 square miles of territory were freed from infestation, reducing the area under quarantine to 453,761 square miles. It is now believed that complete eradication is entirely feasible.

The act carries \$360,000 to continue the hog-cholera work, of which \$175,000 may be used for the enforcement of the virus-serum-toxin

act and \$35,000 for research. An allotment of \$75,000 is also made for the investigation, treatment, and eradication of dourine.

The eradication of foot-and-mouth disease is followed by a reduction in the emergency appropriation for this and similar diseases from \$2,500,000 to \$1,250,000, plus the unexpended balance of \$655,790.93 from the previous year. This amount is available not only for the actual combating of the diseases but for the payment of claims in connection with outbreaks. It is provided that payments may be made for animals hereafter purchased on an appraisement based on their meat, dairy, or breeding value, but in case of appraisement on the basis of breeding value it can not exceed three times the meat or dairy value of the animals, and except in extraordinary emergency Federal payments can not exceed one-half the appraisement.

The meat-inspection work is continued much as at present, a permanent appropriation of \$3,000,000 per annum being augmented by a supplementary allotment of \$344,500.

A net increase of \$27,620 is provided for the encouragement of dairying and one of \$19,260 for that of animal husbandry, making \$277,470 and \$208,320, respectively, available for these purposes. It is planned to extend especially the studies in dairy farming, dairy research, the milk and cheese investigations and demonstrations, and the studies of pork production, Shorthorn cattle breeding, poultry breeding, range sheep breeding and management, and the classification of wools.

A special appropriation of \$60,000 is continued for the work in live-stock production in the cane-sugar and cotton districts, now being conducted in close cooperation with the State of Louisiana. This State has deeded to the Department a farm of about 500 acres at New Iberia, and this farm has been divided into four tracts for work with horses and mules, beef cattle, dairy cattle and hogs, and hogs alone. A large number of demonstrations and other extension work in animal production and dairying are also under way. Somewhat similar work is contemplated under new appropriation of \$40,000 for experiments in dairying and live-stock production in semiarid and irrigated districts of the Western States.

The Bureau of Plant Industry receives an increase from \$2,139,150 to \$2,537,120, its appropriations being divided as usual among a large number of projects. Among the most important new items is that allotting \$250,000 and the unexpended balance of about \$85,000 from a deficiency appropriation of \$300,000 from the previous year for continuing the campaign against the highly infectious disease known as citrus canker. Another large increase is that of \$30,000 for studies of white-pine blister rust and other epidemic tree diseases.

Other extensions of work provided for include \$6,500 for studies of tobacco diseases, \$5,000 for citrus and subtropical fruit diseases and a like amount for breeding disease-resistant citrus varieties, \$2,500 for carrying on soil studies in connection with the powdery scab of potato, \$5,000 for extension work in cotton growing and \$3,000 for cotton diseases, \$5,000 for the development of work on plant-infesting nematodes, \$8,350 for establishing a new grain-standardization laboratory in Minnesota, \$7,500 for studies on the handling, grading, and transportation of the grain sorghums, \$7,500 for studies of the water requirements of crops in the irrigated regions, \$22,500 for investigations of black rust and stripe rust of wheat, oats, and barley, and other cereal diseases, \$10,000 for the development of an American sugar-beet seed industry, and \$21,000 to extend and develop the forage-crop investigations and provide for the more effective distribution of new and rare varieties of seeds. The seed-importation act of 1912 is extended to include vetch and rye grass, and the importation of seed of Kentucky bluegrass and Canada bluegrass is prohibited unless containing at least 50 per cent of live pure seed, while the importation of all other seed subject to the act is prohibited unless it contains 65 per cent of live pure seed. The congressional seed distribution is continued on the usual basis with an allotment of \$252,540.

The allotments for the Forest Service, as usual, far exceed those for any other bureau. The aggregate is \$8,549,735, but, as previously explained, \$3,000,000 of this sum is for additional purchases under the Appalachian Forest Reserve Act, \$2,000,000 of which is not available until July 1, 1917. An appropriation of \$100,000 is also continued for cooperation with the States in fire protection work under the same act. Authority is granted for the prospecting, development, and utilization of the mineral resources of these lands and for the President to set aside suitable areas thereon for the protection of game animals, birds, and fish. In each case regulations are to be prescribed by the Secretary of Agriculture. An arrangement is made whereby timber purchasers may henceforth advance the cost of brush disposal on their cuttings on National Forests, in which case the Department itself will carry on this work at safe and opportune times. The remaining work of the Service is provided for without substantial change, provision being made for the continued administration, protection, and development of the National Forests and for the varied investigations relating to the practice of forestry and the utilization of forest products.

The appropriation for the Bureau of Chemistry aggregates \$1,153,801, of which over half is for the enforcement of the Food and Drugs Act. The purchase and equipment of a traveling laboratory at a cost of \$7,500 is authorized. The various lines of work

under way are continued without change, and \$50,000 is added for studies of the utilization for coloring purposes of raw domestic materials. The Bureau has been studying dyestuffs, more particularly with reference to their use in food products, for over ten years, and it is planned to continue this work, extending it to methods of manufacture of dyes from domestic products. The studies of naval stores were also definitely assigned to the Bureau of Chemistry, and \$5,000 additional was granted to carry on demonstrations of improved methods for preparing these commodities.

The Bureau of Soils is granted \$175,000 for experiments and demonstrations to determine the best methods of obtaining potash on a commercial scale. The remaining lines of work of the Bureau are continued unchanged, the total appropriation being \$503,735.

An increase of \$38,980 is accorded the Bureau of Entomology. This is divided among a number of projects, including extension work in bee culture, and studies of the grape-berry moth, clover seed midge, clover root borer, tobacco hornworm, insects instrumental in the carriage of cucumber diseases, and biting flies and other insects affecting the health of domestic animals. The gipsy and brown-tail moth campaign is allotted \$305,050 and the Bureau as a whole \$568,880.

The Bureau of Biological Survey is granted \$578,230. The principal change is an increase of \$125,000 to be used on the public lands, National Forests, and elsewhere in the Western and Northwestern States to combat the spread of rabies by destroying wolves, coyotes, and other predatory wild animals. This appropriation followed a serious outbreak of the disease in these States, in which serious losses to live stock and even human cases of the disease resulted from an epidemic among coyotes, and continues work begun earlier in the year under a deficiency appropriation of \$75,000.

The total appropriation for the States Relations Service is \$2,969,680, as compared with \$2,821,840 for the previous year. The main item of increase is one of \$100,000 for the farmers' cooperative demonstration work outside the cotton belt. This will permit of considerable further extension of that work and of initiating in a small way extension work by women county agents. There is also an increase of \$23,000 for the experiment stations in Alaska, Hawaii, and Porto Rico. Most of this increase is in lieu of the receipts from the sales of farm products which were formerly available to the insular stations for carrying on their work, but which, since June 20, 1915, have been required to be deposited in the United States Treasury to the credit of miscellaneous receipts and are not available for station use. Additional funds are likewise provided for the administrative and general expenses of the Service by reason of its

increased activities. The other lines of work, including the maintenance of the State experiment stations, the farmers' cooperative demonstration work in the cotton belt, the study of farmers' institutes and agricultural schools, and the investigations in home economics are continued on the existing basis.

The funds allotted to the Office of Markets and Rural Organization are nearly doubled, the total of \$872,590 allowing for a considerable expansion in its work. During the crop season of 1915 an experimental news service was conducted, giving timely information on the movements and prices of the strawberry, tomato, cantaloup, and peach crops, with such successful results that \$136,600 is now provided for systematic service in the collection and distribution of market news by telegraph for perishable fruits and vegetables and by mail for other farm products. Other new items are \$65,000 for the gathering of information pertaining to the marketing of live stock and its products and \$35,000 for cooperation with the States in marketing studies. An increase from \$238,000 to \$285,000 is granted for other marketing and distribution studies, notably for additional attention to cooperative purchasing and marketing, market grades and standards, marketing business practice, and the marketing of live stock, meats, animal by-products, dairy products, grain, seeds, and hay. The Office also receives \$48,000 to continue the cotton-standardization work and \$32,860 for its studies in rural organization.

An increase from \$50,000 to \$75,000 is provided for the enforcement of the plant-quarantine act by the Federal Horticultural Board. Of this sum \$15,000 is to be used to prevent the introduction of the pink bollworm, one of the most serious cotton pests known, and \$10,000 for the inspection of imported potatoes to guard against potato wart and other diseases and insect pests.

The work of the remaining branches of the Department is continued on substantially the present basis, both as to funds and lines of work. The Bureau of Crop Estimates receives \$316,436, an increase of \$32,956, mainly for the employment of additional field agents and specialists, notably in truck and fruit crops. The Office of Public Roads and Rural Engineering is granted \$599,200, an increase of \$12,735; the Office of the Secretary \$688,160, of which \$285,810 is for the Office of Farm Management; the Division of Accounts and Disbursements, \$44,920; the Division of Publications, \$197,650; and the Library, \$19,520. The Department is again allotted \$105,000 for the enforcement of the insecticide act, \$40,000 to continue demonstration work on reclamation projects, and \$123,689 for rent of buildings in the District of Columbia, and receives \$122,500 for miscellaneous expenses.

Exhibits by the Department are provided for at the International Soil Products Exposition to be held at El Paso, Texas, October 17-26, and at the National Dairy Show at Springfield, Massachusetts, October 12-21, with appropriations of \$20,000 and \$15,000, respectively. The former exhibit is to be illustrative of farming methods in the subhumid, arid, and semiarid regions of the country, and the latter of the boys' and girls' club work and other features of the extension work carried on in the North Atlantic States. The President is authorized to extend invitations to other nations to participate in the International Farm Congress and the International Irrigation Congress, both of which are to be held at El Paso.

Reference has already been made to the trio of noteworthy measures appended to the main portion of the act and designated respectively as the United States Cotton-Futures Act, the United States Grain-Standards Act, and the United States Warehouse Act. These measures are all designed to alleviate some of the difficulties which have frequently confronted farmers in the marketing of the staple agricultural crops.

The United States Cotton Futures Act, as reenacted, follows substantially the text of the act passed in 1914. That measure, it will be recalled, was a taxing statute designed to regulate future trading in cotton so that it would be fairly conducted and truly reflect the values of spot cotton. It imposed a tax at the rate of two cents per pound on all contracts of sale of cotton for future delivery entered into on exchanges and like institutions, unless such contracts complied with certain conditions which were calculated to eliminate certain recognized evils in future dealings. Among the conditions necessary to be met in order to exempt a contract from the tax were the use of the official cotton standards of the United States established under the act, and of actual commercial differences in the settlement of such contracts as ascertained from actual sales of cotton in bona fide spot markets. The act also taxed orders sent from the United States for the making of future contracts on exchanges in foreign countries, unless the contracts made on the foreign exchanges complied with certain conditions. The Secretary of Agriculture was given authority to establish the official standards, to designate the bona fide spot markets, and to determine disputes referred to him by the parties to future contracts involving the grade, length of staple, or quality of cotton offered for delivery thereunder. The most important changes made in the new act are the omission of the tax on orders sent abroad for the making of future contracts and the addition of authority for the Secretary of Agriculture in settling disputes to include in his findings a complete classification of the cotton involved. The new act became effective Sep-

tember 1, an appropriation of \$120,750 and the unexpended balances from appropriations for the previous measure being available for its enforcement.

The United States Grain-Standards Act authorizes the Secretary of Agriculture to investigate the handling and grading of grain, establish official standards, license grain inspectors, and otherwise administer its provisions. After the standards for a grain have become effective, all shipments by grade in interstate or foreign commerce must either be inspected by a licensed inspector at the point of shipment, during transit, or at the point of delivery, or, if there are no inspection facilities available, may be marketed uninspected but subject to the right of either party to the transaction to refer any dispute as to the grade to the Secretary of Agriculture for his determination. An appeal to the Secretary may also be taken as to the true grade of grain which has been inspected. The findings of the Secretary in cases of dispute and appeals are made *prima facie* evidence in court proceedings.

The certifying of an official grade on shipments subject to Federal supervision is restricted to inspectors holding Federal licenses. These licenses are to be issued to persons authorized to inspect and grade grain under State laws, or may be issued to any competent and disinterested person, and may be suspended or revoked for cause. A complete system of records and reports is required of inspectors, and penalties are provided for false grading, interference with officials and other violations of the act.

The legislation is designed to facilitate the use of more uniform grades in handling grain, thus simplifying the relations between the producer, dealer, and consumer. Since the final decision as to the grade of a shipment rests with the Department, it is also expected that the grower may more readily obtain higher returns for a product of superior merit, thus supplying him with a financial incentive to improve its quality. An appropriation of \$250,000, available until expended, is made for the enforcement of the act.

The central purpose of the United States Warehouse Act is to establish a form of warehouse receipt for cotton, grain, wool, tobacco and flaxseed which will make these receipts easily and widely negotiable as delivery orders or as collateral for loans, and therefore of definite assistance in financing crops. This purpose the act aims to attain by authorizing the licensing of bonded warehouses under conditions which will insure the integrity of their receipts and make these receipts reliable evidence as to the condition, quality, quantity and ownership of the products for which they are issued.

The Secretary of Agriculture is given authority to inspect, classify and license warehouses when found suitable for the storage of these commodities, as well as to establish official standards for them.¹⁰

issue licenses to competent persons to classify and weigh the products to be stored in the warehouses, and to conduct warehouse investigations. The system of licensing is entirely voluntary, but provides for Federal licenses, when desired, for warehouses in which cotton, grain, wool, tobacco, and flax may be stored for interstate or foreign commerce, or located in places under the exclusive jurisdiction of the United States, or owned, operated, or leased by any State. Applicants must agree to comply with the act and the rules and regulations prescribed under it and give bond to secure the performance of their obligations. The form of receipt and manner of delivery of products are prescribed in detail, and records and reports are subject to examination by the Department. All grain, flaxseed, or other fungible products stored in these warehouses for interstate or foreign commerce must also be inspected and graded by persons licensed for the purpose. The licenses may be revoked for cause, and penalties are provided for fraudulent transactions. The Warehouse Act became effective at once and carries an appropriation of \$50,000, available until expended, for its enforcement.

In a discussion of the appropriation act as a medium for the support of the Department of Agriculture, reference should also be made to the funds administered by it but appropriated in other ways. For the fiscal year under discussion, what are termed the permanent appropriations under the Department will aggregate 10,604,000, the largest items being those of \$5,000,000 for the construction of rural post roads under the law recently described (E. S. L. 35, p. 200), of which not to exceed \$150,000 may be used by the Department for administering the act; \$3,000,000 for meat inspection; and \$1,580,000 under the Smith-Lever Extension Act; the remainder being chiefly for payments to the States as their quota of the receipts from the National Forests. There is also the appropriation for the Department printing and binding, carried as usual in the appropriation act for sundry civil expenses. This appropriation has been increased from \$500,000 to \$600,000, of which \$47,000 is for the Weather Bureau and \$177,500, an increase of \$40,000, for use in the publication of Farmers' Bulletins.

Nor are the Federal appropriations for agricultural purposes confined to the Department of Agriculture. The usual large appropriations will be available for agricultural education in the land-grant colleges under the Morrill and Nelson Acts, as well as the smaller grants for the rural education work of the Bureau of Education, demonstration work among the Indians, and the payment of the country's quota toward the support of the International Institute of Agriculture. The aid granted under the Federal Farm Loan Act

has been already discussed (E. S. R., 35, p. 101). A provision is also carried in the National Defense Act of June 3, 1916, for an investigation of means for the production of nitrates and other products for munitions of war and useful in the manufacture of fertilizers, and for the construction and operation by the Government of a plant or plants to manufacture these products. This enterprise carries an appropriation of \$20,000,000.

The substantial aid tendered to agriculture in these various ways indicates anew the increasing popular realization of the responsibility of the Federal Government in the development of the Nation's basic industry. The program of work outlined for the coming months is unusually broad and comprehensive, and extends the functions of the Department in a number of new and important directions. It augments especially its administrative and regulatory powers, but it also provides more liberally than ever before for the development of scientific research and the dissemination of agricultural knowledge. There will be general concurrence in the view expressed by President Wilson, after signing the appropriation act, that it will tend to "result in making agriculture more profitable and country life more comfortable and attractive, and therefore insure the retention in rural districts of an efficient and contented rural population."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Practical physiological chemistry, P. B. HAWK (*Philadelphia: P. Blakiston's Son & Co., 1916, 5. ed., rev. and enl., pp. XIV+638, pls. 6, figs. 172*).—This is the fifth edition of the volume previously noted (E. S. R., 21, p. 63). The chapters on nucleic acids and nucleoproteins, gastric analysis, intestinal digestion, blood analysis, and metabolism are new and have been inserted to increase the usefulness of the volume and to keep thoroughly abreast with recent developments in physiological chemistry. The latest methods of quantitative analysis have also been introduced throughout the volume. Thirty-five new illustrations have been incorporated.

Yearly report in regard to the progress made in agricultural chemistry, edited by T. DIETRICH and F. MACHE (*Jahresber. Agr. Chem., 3. ser., 17 (1914), pp. XXIX+563*).—A report of the work of 1914 in continuation of that previously noted (E. S. R., 34, p. 311).

Report of the committee on editing methods of analysis (*Jour. Assoc. Off. Agr. Chem., 1 (1916), No. 4, pt. 2, pp. 57, figs. 4*).—This report contains the recommendations of the committee on editing methods for official and tentative methods of analysis of fertilizers, soils, inorganic plant constituents, waters, and tanning materials, presented at the annual meeting of the Association of Official Agricultural Chemists, November 16-17, 1915.

On the origin of the humin formed by the acid hydrolysis of proteins, R. A. GOTTMER and M. J. BLISH (*Jour. Amer. Chem. Soc., 37 (1915), No. 6, pp. 1551-1556; also in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 8, p. 1026*).—It has been demonstrated that "in all probability the humin nitrogen of protein hydrolysis has its origin in the tryptophan nucleus." When tryptophan is boiled alone with mineral acids no humin is formed; when protein or carbohydrate is present, however, an abundance is formed. With large amounts of carbohydrate present nearly 90 per cent of the tryptophan nitrogen remains in the humin fraction. Histidine causes no increase of nitrogen in the humin fraction and can be quantitatively recovered in the bases. The humin is probably formed by condensation of an aldehyde (formed by the action of the acid on carbohydrate) with the NE group of the tryptophan nucleus. It is indicated that a distinct value can thus be assigned to the humin nitrogen determinations.

Fractionation of the phosphotungstic-acid precipitate with acetone as a useful method for the preparation of the vitamin fraction from yeast, C. FINK (*Biochem. Bul., 5 (1916), No. 17, pp. 1-16*).—The author has demonstrated that "the phosphotungstate precipitate from alcohol extract of yeast can be divided, by means of acetone, into two fractions: A small insoluble fraction which contains the bulk of vitamin, and a large soluble one which is totally inactive." Lead acetate was used to decompose the phosphotungstates instead of baryta, as this procedure offered the advantage of yielding clear solutions which facilitated further purification and avoided the use of alkali. From catalyzed yeast an insoluble fraction could be obtained by the acetone method which represented 34 per cent of the total phosphotungstate precipitate.

The molecular weights of certain vegetable oils, H. J. BACKER (*Chem. Weekbl.*, 12 (1915), No. 47, pp. 1034-1040; *abs. in Analyst*, 41 (1916), No. 47, p. 47).—The average molecular weights of a number of vegetable oils, calculated from the lowering of the freezing point, are submitted, as follows: Coconut oil 613, cohune nut oil 625, arachis oil 803, cato seed oil 803, cato seed oil (hydrogenated) 884, linseed oil 796, maize oil 796, mustard seed oil 928, olive oil 889, palm kernel oil 644, rape oil 892, castor oils 844 and 1,081, sesame oil 800, and soy-bean oil 788. A commercial sample of blown rape oil showed a molecular weight of 1,335.

Other physical constants of these oils are also given.

Philippine oil-bearing seeds and their properties, H. C. BRILL and F. ACCAONI (*Philippine Jour. Sci.*, Sect. A, 10 (1915), No. 2, pp. 105-121, *figs. 2*; *abs. in Ztschr. Angew. Chem.*, 29 (1916), No. 18, *Referatentcil*, p. 114).—The percentage yields, chemical constants, physiological properties, and commercial possibilities of several Philippine oils have been studied and the results reported in detail.

It has been demonstrated that the oil from the lumbang bato (*Aleurites moluccana*) and lumbang banucalag (*A. trisperma*) are drying oils of high quality, comparing favorably with linseed and Chinese wood oils, while the oil from the nuts of the calumpang, cato (*Chisochiton cumingianus*) kapok, pili, palo maria de la playa (*Calophyllum inophyllum*), and palo maria del monte (*C. aculeatum*) have no appreciable drying qualities.

On the heating of hay during the curing process, F. W. J. BOEKHOUT and J. J. O. DE VRIES (*Verstag. Landbouwck. Onderzoek. Rijkslandbouwproefst. [Netherlands]*, No. 19 (1916), pp. 61-80, *fig. 1*).—Analytical data of a number of samples of gas obtained in the curing of hay are submitted in detail.

The heating in the process of curing is largely attributed to a purely chemical action in which iron acts as a catalyst. Bacteria and enzymes also play an important rôle in the process. Attempts to sterilize the hay with a 2 per cent solution of copper sulphate were unsuccessful, since the growth of yeasts and molds could not be controlled by this treatment. The production of furfural in the curing of hay, as noted by earlier investigators, was confirmed.

[The nature of the coloring matter of sugar cane], M. A. SCHNEIDER (*Louisiana Stat. Rpt. 1915*, pp. 13, 14).—Preliminary results indicate that substances belonging to the polyphenols are present in cane, especially the roots and tops, and cause in connection with iron the dark color of juice and syrup. The action of boiling temperatures and sulphur dioxide in the sugar house results only in a temporary decomposition and reduction of the polyphenol iron compound and decolorization of the products. The darkening of plantation white sugars in storage must be sought in reoxidation of adhering or occluded traces of the iron polyphenol. Decomposition products of a similar nature (guaiacol acid) are also formed by the action of lime at alkaline reaction on glucose. Alkalinity is, however, avoided in the white sugar manufacturing in this State. A means of elimination of the polyphenols could be found in the bone-black process, generally discarded as too costly. Elimination of iron by secondary carbonation, or a similar process, has the same result, but would be successful only if further contact of the liquors with iron were completely avoided. Lining of the iron equipment with rust-proof enamel might lead to a distinct improvement.

"The incrusting coloring matter of cane fiber, although perhaps the physiological product of the above-mentioned polyphenols and of a similar chemical composition (coniferin or a derivative), does not yield dark-colored iron com-

pounds and owing to its firm combination with the lignin of the cell walls is only separated with difficulty and would not easily pass into the juice."

Studies on the relation of cement dust to citrus vegetation.—I, The effect in photosynthesis, H. D. YOUNG (*Biochem. Bul.*, 5 (1916), No. 18-19, pp. 95-100).—The investigation has shown that the coating of dust on orange leaves adjacent to cement plants amounted in many cases to as much as 0.0034 gm. per square centimeter and corresponded in composition very closely to the "raw mixture" from which the cement was made. The amount of dust found on such leaves may shut out as much as 80 per cent of light from the upper surface of the leaf. This exclusion of light, however, does not interfere with the carbohydrate synthesis. The metabolic activity of new leaves was only slightly greater than that of old leaves.

Researches on arginase; concerning the action of arginase on creatin, A. CLEMENTI (*Atti R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 24 (1915), I, No. 5, pp. 488-489).—It has been demonstrated that creatin is not hydrolyzed into urea and sarcosin by arginase, thus confirming the previous finding of Dakin.⁶ Arginase is not a ferment capable of detaching the guanidin nucleus from any compound to which it may be bound, as would be indicated by the name "deguanidase," which has recently been proposed. The inability of arginase to hydrolyze creatin supports the contention of the specificity of the enzym.

Adsorption of invertase, J. M. NELSON and E. C. GRIFFIN (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 5, pp. 1109-1115).—From the investigation it is concluded "that invertase is colloidal in nature, and the reaction between the enzyme and cane-sugar solution depends on the contact of two phases. The activity of invertase . . . is not affected whether or not the enzyme is adsorbed to a solid like charcoal, or to a colloid like saponin, serum, or egg albumin, distributed uniformly throughout the solution of the substrate. Displacing the adsorbed invertase by a second colloid is without effect on the activity, contrary to the views held by many. Invertase can be removed from an aqueous solution by adsorption to a solid, and again brought into solution by a second colloid suspended uniformly throughout the solution. Eriksson's proof that cane sugar can liberate invertase adsorbed to charcoal is not valid."

The experimental methods used were those described in the communication previously noted (E. S. R., 34, p. 803).

The occurrence of urease in higher plants, M. W. BEIJERINCK (*Chem. Weekbl.*, 13 (1916), No. 16, pp. 443, 444).—The author has found urease in the cortex of the twigs and in the buds of *Glycine sinensis* and *Cytisus laburnum*. The seeds of the latter were especially rich in urease, although considerably less was found than is present in the soy bean. Its presence was also demonstrated in the bark of the ordinary acacia, *Robinia pseudacacia*, in the seeds of the indigo plant, and in the tissues of the various herbaceous Papilionaceae. Its presence could not be determined in peas, beans, flaxseed, almonds, and various other plants examined.

A simple device for regulating the pump used in exhausting a vacuum oven, G. P. PLAISANCE and D. V. MOSES (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 5, pp. 1063-1065, fig. 1).—The authors describe in detail a simple automatic device for maintaining any desired pressure in a Freas electrically heated vacuum oven. The apparatus is easily assembled and has given entire satisfaction.

A new form of gas burette, HAMMERMANN (*Chem. Ztg.*, 40 (1916), No. 10-11, p. 84, fig. 1).—An apparatus to measure gases only slightly soluble in water, in

⁶ *Jour. Biol. Chem.*, 3 (1907), No. 5, pp. 435-441.

which the burette and leveling bulb are mounted together on a Woulff bottle, and its manipulation are described in detail.

A simple, efficient, and economic filter, S. L. JODINI and E. H. KELLOGG (*Biochem. Bul.*, 5 (1916), No. 18-19, pp. 87-94).—The authors describe in detail the preparation and use of the paper pulp filter and demonstrate its efficiency by submitting analytical data. Its application to the filtration of the ammonium-phosphomolybdate precipitate in phosphorus determinations is especially indicated.

See also previous notes (E. S. R., 34, p. 712; 35, p. 204).

A modification of the Lunge nitrometer, W. SENFTEN (*Chem. Zeit.*, 40 (1916), No. 4-5, pp. 39, 40, figs. 2).—A modified apparatus, which shortens the time for making determinations by insuring the complete solution of the sample, and its manipulation are described in detail. A new gas burette for use in connection with the apparatus is also described.

The quantitative determination of silica, V. LENHÉR and E. TRUOG (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 5, pp. 1050-1063).—After preliminary experiments on the various factors which influence the solubility of silica the following procedure was adopted:

A 0.5 to 1 gm. sample is intimately mixed with 5 gm. of sodium carbonate and fused in a platinum crucible. The cold fusion is treated with 60 cc. of hydrochloric acid (specific gravity 1.07). After all carbonates are decomposed the solution is evaporated on the water bath until the residue begins to crumble. The residue is treated with 15 cc. of hydrochloric acid (specific gravity 1.1), covered, and heated on the water bath for ten minutes. After diluting with 10 cc. of water it is filtered and the silica washed with a hot solution consisting of 5 cc. of hydrochloric acid (specific gravity 1.2) to 95 cc. of water. The filtrate is evaporated to dryness, the residue dehydrated at 110° C. for two hours, taken up with 8 cc. of hydrochloric acid (specific gravity 1.1), covered and heated on the water bath from five to ten minutes, diluted to 50 cc., and filtered immediately, washing with cold water containing 1 cc. concentrated hydrochloric acid to 99 cc. of water. The two portions of silica thus obtained are carefully ignited to constant weight in a platinum crucible and the silica determined by volatilization with hydrofluoric acid after the addition of a few drops of sulphuric acid.

It is indicated that in the sodium-carbonate fusion methods for silicates there is always a nonvolatile residue which contains the various bases and which should be fused again with sodium carbonate and added to the filtrate from the silica when the bases are to be determined.

Dehydrated silica is appreciably soluble in hydrochloric acid of all strengths. This error is, however, negligible when dilute acid is used. The dehydration temperature should be kept below 110°. Excessive amounts of sodium carbonate should be avoided in the fusion, since the subsequently formed sodium chlorid exerts a solvent action on the silica.

Comparative tests of certain methods for the determination of copper in copper sulphate, von WISSELL and F. KÜSPERT (*Landw. Vers. Stat.*, 86 (1915), No. 3-4, pp. 277-286).—As a result of the comparison of the various methods used for the determination of copper in fungicidal materials in the presence of iron the thiocyanate procedure was found to yield reliable results and to be the simplest and most economical of all the methods tried, especially where only occasional determinations are necessary.

The Gréte volumetric method for the determination of phosphorus in fertilizers, G. INCE (Kísérlet. Közlem., 18 (1915), No. 5-6, pp. 797-809).—From a critical examination of the method the author has found that the proper pre-

aration of the reagent used in this method is very important, particularly the preparation of the glue solution. The presence of hydrochloric acid, large amounts of iron, and, especially, organic substances influence the correctness of the titration. The water-soluble phosphoric acid in superphosphates and that obtained from Thomas slag by digestion with sulphuric acid can be determined directly after neutralizing the solution. The procedure is applicable to routine analyses but is not recommended on account of the care and patience required in its manipulation. The accuracy of the method is indicated by submitted experimental data.

The volumetric determination of potassium and its application in the analysis of fertilizers, G. AJON (*Ann. R. Staz. Sper. Agrum. e Frutticolt. Acireale*, 3 (1915), pp. 91-104).—The procedure described by the author is as follows:

About 25 cc. of a 2 per cent solution of potassium chlorid or potassium sulphate, or an amount equivalent to from 1.08 to 1.26 per cent of potassium oxid, is transferred to a 150-200 cc. Erlenmeyer flask, 50 cc. twice-normal tartaric acid added, and the mixture thoroughly shaken. Twenty-five cc. of half-normal sodium hydroxid is then added and the mixture again strongly agitated for five minutes. To this 25 cc. of 96 per cent alcohol are added and the flask and contents allowed to stand for from six to eight hours. The precipitate thus formed is washed by decantation several times and finally transferred to the filter, where it is thoroughly washed with neutral 96 per cent alcohol. It is then treated with tenth-normal alcoholic sodium hydroxid until strongly alkaline to phenolphthalein, and allowed to set for about five minutes with occasional shaking. When the precipitate is completely dissolved the amount of tenth-normal hydroxid used is determined by titration with standard hydrochloric acid.

The number of cubic centimeters of tenth-normal sodium hydroxid used to dissolve the bitartrate, multiplied by 0.00471, gives the amount of K₂O present in the original solution. Analytical data submitted indicate the accuracy of the method.

The use of enzymes and special yeasts in carbohydrate analysis, W. A. DAVIS (*Internat. Sugar Jour.*, 18 (1916), No. 268, pp. 166-171).—This material has been previously noted from another source (E. S. R., 35, p. 206).

The possibility of titrating the monosubstituted amino group of amino acids with formol, A. CLEMENTI (*Atti R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser.*, 24 (1915), I, No. 4, pp. 352-359; *Arch. Farmacol. Sper. e Sci. Aff.*, 21 (1916), No. 6, pp. 215-224; *abs. in Chem. Abs.*, 9 (1915), No. 17, p. 2394).—The Sörensen formol titration method for the determination of the quantity of amino groups in amino acids has not as yet been applied to amino acids in which the amino group is partly or completely substituted. The author has performed experiments of this kind with sarcosin, and shows that the amino group, even if monosubstituted, reacts with formaldehyde. In titrating monosubstituted amino acids according to Sörensen's method it is, however, necessary to titrate to the intense coloration of phenolphthalein, as otherwise the results will be slightly too low.

Concerning the protein content of meat, N. W. JANNEY (*Proc. Soc. Expt. Biol. and Med.*, 13 (1916), No. 5, pp. 83, 84).—The author indicates the error inherent in the protein determinations in meat because of the large amount of nonprotein nitrogen present. The average nitrogen content of meat proteins lies between 16.2 and 16.7 per cent, and is not 16 as the factor 6.25 commonly used indicates. The principle involved in a modified procedure for the direct determination of the proteins in muscle is the coagulation of the muscle in alcohol and the removal of nonprotein material by extraction. With proper precau-

tions it is possible to separate completely the fatty and other nonprotein material from the proteins so that they can be obtained in a high state of purity.

Analytical data of the protein content of dog, rabbit, chicken, and fish (half-but) muscle are included.

The rapid analysis of milk. G. PÉGURIER (*Ann. Chim. Analyt.*, 21 (1916), No. 4, pp. 70-73, fig. 1).—The author describes rapid procedures for the determination of the specific gravity, fat, and lactose, to be used in the field for ascertaining the purity and food value of milk. The specific gravity is determined in the usual manner; the fat in an ordinary or a specially graduated test tube, by extraction with an alcohol-ether mixture after the addition of a few drops of alkali; and the lactose by Fehling's solution, after precipitation of the protein with a reagent composed of phenol and acetic and citric acids in 5 per cent alcohol.

Note on human milk. G. D. ELDON (*Analyst*, 41 (1916), No. 480, p. 74).—The following figures, obtained from 67 complete analyses representing the average percentage composition of human milk, are submitted: Total solids 11.7, protein 1.19, fat 3.11, ash 0.21, solids-not-fat 8.59, and lactose 7.18 per cent. In 79 other samples the total solids averaged 11.78, fat 3.28, and solids-not-fat 8.5 per cent.

[Methods of direct sucrose determinations in the presence of reducing sugars.] M. A. SCHNELLER (*Louisiana Stas. Rpt.* 1915, p. 14).—In the methods based on the action of small amounts of alkali on the rotary power of the reducing sugars several sources of error were found to be inherent, which are summarized as follows: "(1) The residuary levorotation introduces a considerable error, especially with material high in reducing sugar and with methods using a weak concentration of alkali. (2) Stronger concentrations of alkali reduce this levorotation but introduce a second serious error due to the decrease of sucrose rotation by the neutralized alkali. (3) The incidental use of oxidants (as hydrogen peroxid) also causes a destruction of sucrose. Apparently correct results are possible by compensation of errors due to (1) and (3)."

Studies on the analysis and analytical products of glucose. T. VAN DER LINDEN (*Arch. Suikerindus. Nederland. Indie*, 23 (1915), No. 52, pp. 1879-1884; *Meded. Proefstat. Java-Suikerindus.*, 5 (1915), No. 22, pp. 609-624).—In the analysis of invert sugar by barium or calcium hydroxids at 80° C. the author has obtained appreciable amounts of saccharic and gluconic acid, together with a small amount of oxalic acid. Formic acid was also formed, but the presence of lactic acid could not be determined. The acids were isolated in a pure form by precipitation with neutral, basic, or ammoniacal lead acetate. The experimental procedures used in the work are described in detail.

The American Leather Chemists Association, 1916 (Amer. Leather Chem. Assoc. [By-laws, etc.], 1916, pp. 37).—This pamphlet outlines in detail the official methods for the analysis of vegetable materials containing tannin, for sampling tanning materials, and for leather analysis. Provisional methods for the analysis of sulphonated oils, melloons, and hard greases are also included.

[Report of the] bacteriological department. W. L. OWEN (*Louisiana Stas. Rpt.* 1915, pp. 11-18).—From results obtained in a study of the deterioration of sugars, and the principal factors affecting it, "it appears that neither the moisture alone, nor when used in conjunction with the factor of safety, furnishes a reliable criterion of the keeping quality of a sugar, but that its degree of infection must also be taken into consideration."

In a study of the species of micro-organisms causing deterioration of sugar, 18 cultures of bacteria and 20 cultures of yeast were obtained from sugar. "There appears to be considerable variation in the deteriorative power of the

different species, which is not altogether obliterated by repeated cultivations. Sugars from widely distant countries show no greater variation in this respect than sugar from adjoining plantations. . . . It was observed that the micro-organisms found in sugars do not predominate either in the mill juice or on the cane leaves. Analyses showed these sugar deteriorative forms to occur only to the extent of 19.5 per cent in the fresh juice. From this point they increase to 46 per cent and 91.5 per cent in the sulphured and defecated juice, respectively. The filter press appears to be the vital point in determining the infection of the finished sugars."

A distinct and hitherto undescribed species of bacteria, commonly occurring in the interior of borer-infested cane, was isolated and named *Bacterium saccharum officinarum*. "Inoculation experiments upon cane showed . . . that it is not a great factor in the deterioration of the juice of the growing cane, hence its presence there does not apparently aggravate the deterioration following borer infestation."

The products of the farm slaughterhouse, sausage kitchen, and smoke house, A. HARING and W. HISTOP (*State Col. Wash., Dept. Ext. Bul. 10* (1916), pp. 23, figs. 6).—This pamphlet discusses the slaughtering of beef cattle, veal, sheep, goats, and hogs, and outlines the methods in use for the curing and smoking of meats. Directions for the preparation of various kinds of sausage, lard, soap grease, and tripe, together with a list of tools for the farm slaughterhouse, are included.

Forest chemistry, PURAN SINGH (*Ann. Rpt. Bd. Sci. Advice India, 1914-15*, pp. 19-27).—These pages contain brief comments on minor products distilled from the deodar and their value and uses, the optical rotation of steam-distilled deodar oil, the dry distillation of deodar, the best season for collecting myrobalans as a tannin material, an inquiry as to the possibility of reducing the harshness of tan barks, the manufacture of products from *Boswellia serrata* and their chemical composition, Indian sumac, use of nickel hydroxid in tannin estimation, camphor in dried camphor leaves, the camphor content of the various parts of a camphor tree, and the determination of moisture in fresh camphor.

The conifer leaf oil industry, A. W. SCHORGER (*Metallurgy and Chem. Engin.*, 14 (1916), No. 9, pp. 515-518, figs. 4).—This article discusses the conifer leaf oil industry and describes the still and its operation. Certain factors which influence the yield of oil are indicated.

A table giving the yield of oil, specific gravity, and principal constituents of a number of the conifer leaf oils is submitted.

METEOROLOGY.

Illusions of the upper air, N. SHAW (*Nature [London]*, 97 (1916), Nos. 2426, pp. 191-194; 2427, pp. 210-214, figs. 3).—This is a brief review of progress in meteorological theory in England since 1860, showing how the development of upper air research has modified commonly accepted views regarding the atmosphere in general, especially the conception of cyclones and anticyclones, the convection theory, and the general structure of the atmosphere. It is stated that the principal result of this study of the upper air "is the division of the atmosphere into two layers: A lower layer about 10 km. thick, the troposphere, the region of convection; and an upper layer, the stratosphere, in which there is no convection. We can use the information to test some of the generally accepted ideas about cyclones and anticyclones by comparing the results of speculation with the new facts. Many of the pictures which we imagined now appear to have been illusions. Those of us, for example, who thought that because the air was warmed from the bottom, the upper part

would be free from sudden changes of temperature such as we get at the surface were rapidly and rudey disappointed. Simplicity is not apparently the characteristic of the upper air."

Night cooling and the importance of the dew and frost points. J. SCHUBERT (*Met. Ztschr.*, 32 (1915), No. 8, pp. 343-350, figs. 3).—The observations of various investigators bearing on the relations of the temperature of the surface of the earth and the overlying air, and of the pressure and humidity of the air, to the formation of dew and frost are critically reviewed and discussed in this article.

The following are among the conclusions reached from the data cited:

With a given pressure, the frost-point is higher than the dew-point. The frost-point T_f may be calculated from the dew-point T within 0.1° by the formula $T_f = 0.9T$. For more accurate reckoning for temperatures from 0 to -14° the factor 0.89 should be used. The dew-point runs parallel with the air temperature from midnight to 6 a. m. The surface temperature falls more rapidly than that of the overlying air and may be below the dew-point while the overlying air is still above. Dew begins to form with a humidity of 90 per cent, is greater at 95 per cent, and turns to fog at 99 per cent. The formation of dew results in a distinct lowering of pressure. During the last half of the night the fall of temperature is relatively less with formation of dew and frost than with dry air, due to heat set free by condensation.

Frost protection for fruit and vegetables in the United States (Abs. in *Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 1, pp. 36-42).—This is a summary of a number of papers on this subject, most of which have been separately noted in the *Record*.

The weather of 1915. J. A. MURRAY (*Rpt. Agr. New Brunswick*, 1915, pp. 161-169).—Observations on temperature, precipitation, and sunshine at Fredericton, N. B., and on temperature at various other places in the Province are tabulated and briefly discussed. The season of 1915 was unusual and unfavorable for farming mainly on account of excessive precipitation and diminished sunshine.

The weather of the past agricultural year. F. J. BRODIE (*Jour. Roy. Agr. Soc. England*, 76 (1915), pp. 171-180).—The weather conditions throughout the British Isles during 1915 are summarized as usual and comparisons made with the weather of previous years. It is stated that as a result of a succession of adverse weather influences the yield of crops during the year was generally below the average.

Hailstorms and hail prevention during 1915 in the departments of Gironde and Dordogne, France. A. ANGOR (*Compt. Rend. Acad. Agr. France*, 2 (1916), No. 20, p. 558).—This is a brief note on a more detailed report by F. Courri in a bulletin of the Meteorological Commission, the principal conclusion of which is that hailstorms are always irregular in occurrence and distribution, and that the electric tower method of prevention apparently exerts no practical influence on their course or intensity.

Annual distribution of cloudiness in France. G. BIGOURDAN (*Compt. Rend. Acad. Sci. [Paris]*, 162 (1916), No. 17, pp. 620-625, figs. 13; abs. in *Rev. Sci. [Paris]*, 54 (1916), I, No. 9, p. 285).—This is a report of a complete study for France similar to that which has been undertaken by Teisserenc de Bort for the whole world. Curves, isoneph, connecting points of equal mean monthly cloudiness are given and discussed. Attention is called to the need for this purpose of longer series of observations at a greater number of places.

International catalogue of scientific literature. F—Meteorology (*Internat. Cat. Sci. Lit.*, 12 (1915), pp. VIII+194).—"The literature indexed is mainly that of 1912, but includes those portions of the literature of 1901-1911 in regard

to which the index slips were received by the Central Bureau too late for inclusion in the previous volumes. There are also entries dated 1913." The section on the relation of climate to agriculture contains 18 references, that on phenology 8.

SOILS—FERTILIZERS.

Soils courses at the Iowa State College, P. E. Brown (Jour. Amer. Soc. Agron., 8 (1916), No. 1, pp. 42-47).—The soils courses at the Iowa State College are briefly outlined and discussed, the five distinct groups now recognized being soil physics, soil fertility, soil bacteriology, soil surveying, and soil management.

Mechanical study of soil, D. J. HISSINK (Indische Mercur, 38 (1915), No. 47, pp. 975-977).—This is a general statement of the present status of the mechanical classification of soils.

The colloids of clay and humus soils, P. ROHLAND (Naturw. Ztschr. Forst u. Landw., 13 (1915), No. 8-9, pp. 369-367).—This is a second brief contribution to the subject (E. S. R., 32, p. 318).

Experiments on water holding in vegetation pots, P. EHRENBURG, F. BAHR, and O. NOLTE (Jour. Landw., 63 (1915), No. 3, pp. 199-225).—Pot culture experiments with corn in sand to test the relative values of various substances for increasing the water-holding capacity of sand in pot culture experiments are reported. The pots contained about 15 kg. of sand; and emery, pulverized glass, and barium sulphate were added in 1 kg. amounts; kieselguhr, artificial zeolite, and clay in amounts of $\frac{1}{2}$ kg.; and peat dust $\frac{1}{4}$ kg.

The results are taken to indicate that of the materials tested barium sulphate may be used to the best advantage for increasing the water-holding power of sand in sand cultures. Under certain conditions kieselguhr may be used, but emery only in special cases. Powdered glass, artificial glass, clay, and peat are considered unsuited for general use for this purpose.

Miscellaneous samples, soils, L. HEIMBURGER (Fla. Quart. Bul. Dept. Agr., 26 (1916), No. 1, pp. 167-174).—This section of the report contains the results of analyses of 21 samples of Florida muck, rock, and calcareous, sandy, forest, and humus soils.

Soil survey of Elkhart County, Indiana, G. B. JONES and R. S. HESLER (U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 28, fig. 1, map 1).—This survey, made in cooperation with the Indiana Department of Geology and issued May 25, 1916, deals with the soils of an area of 295,680 acres in northern Indiana, the topography of which is characteristic of a glaciated region and varies from flat to hilly. The soils are of glacial origin and are grouped as upland and sand-plains soils. Exclusive of muck, peat, and meadow, eleven soil types of four series are mapped, of which the Miami loam, Plainfield sandy loam, and Miami sandy loam cover 37, 27, and 12.5 per cent of the area, respectively.

Soil survey of Lafayette Parish, Louisiana, A. H. MEYER and N. M. KIRK (U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1915, pp. 32, fig. 1, map 1).—This survey was issued May 22, 1916, and deals with the soils of an area of 176,610 acres in southern Louisiana which lies mostly in the coastal prairie region of the Gulf Coastal Plain province. "By far the greater portion consists of the uplands, or terrace, the surface of which is, for the most part, practically level." In general the drainage is fairly good.

The soils are grouped as upland and first bottom. Excluding muck and swamp, ten soil types of nine series are mapped of which the Oliver, Lintonia, and Crowley silt loams cover 38.6, 25.6, and 11 per cent of the area, respectively.

Soil survey of Ramsey County, Minnesota, W. G. SMITH and N. M. KIRK (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 57, figs. 2, map 1*).—This survey, issued May 17, 1916, deals with the soils of an area of 103,040 acres in east-central Minnesota, the surface of which is hilly with intervening areas of level to rolling lands. Drainage is incompletely established over a large part of the county.

The soils are directly or indirectly of glacial origin and are predominantly loams. Including marsh and rock outcrop, 18 soil types of 10 series are mapped, of which the Gloucester loam, Merrimac loamy fine sand, Miami loam, Merrimac loam, and marsh cover, respectively, 16.1, 13.7, 11.3, 11.2, and 10.6 per cent of the area.

Report on the soils of Fiji, I. C. H. WRIGHT (*Dept. Agr. Fiji Bul. 9* (1916), pp. 22).—Analyses of two samples of banana soil from Nasinu, three samples of coconut soil from Laucala, two samples of red and two samples of black "soapstone" soil from Suva, four samples of alluvial soil from Navua, and one sample of banana soil from Galoa and one sample of swamp soil from Qaraniqo are reported, together with appendixes giving instructions for taking official and private samples of soil for analysis and instructions for mechanical analysis.

Some Johore soils. J. GRANTHAM (*Agr. Bul. Fed. Malay States, 4* (1916), No. 4, pp. 114-121).—Mechanical and chemical analyses of five samples of rubber soils from Johore Bharu, 11 samples of rubber and three samples of coconut soils from Muar, and seven samples of rubber soils from Batu Anam, in Johore, Federated Malay States, are reported.

Studies on nitrogen fixation and Azotobacter forms in soils of foreign countries. C. B. LIPMAN and P. S. BURGESS (*Centbl. Bakt. [etc.], 2. Abt., #* (1915), No. 17-23, pp. 481-511, pl. 1).—Studies of the nonsymbiotic nitrogen-fixing flora, especially those of the Azotobacter group, and of the nitrogen-fixing powers of the mixed soil flora of 46 soils from Egypt, India, Japan, China, Syria, the Hawaiian Islands, Guatemala, Costa Rica, Spain, Italy, Russia, Mexico, Asia Minor, Canada, Unalaska, Samoa, Australia, Tahiti, Belgium, Queensland, and the Galapagos Islands are reported.

The plan of experiment "consisted in studying the appearance of the cultures obtained from soil inoculation into [Lipman's mannite solution], making a microscopic study of the mixed flora, isolating pure cultures from the mixed flora plated out on mannite agar, studying the morphology of these, and determining the nitrogen-fixing powers in both solutions and soils of those forms which selected from the large number of pure cultures, were distinctly different from one another."

It was found in the mixed culture experiments that only about one-third of the soils tested contained Azotobacter. "A fixation of 5 mg. of nitrogen per gram of mannite or over occurred in only 20 out of 40 soils. In 16 of these 20 soils Azotobacter organisms were found. . . . Soils from the Mediterranean region when compared with soils from all parts of the world manifest very high nitrogen-fixing powers in mannite solution and bear a vigorous Azotobacter flora. Many of the soils studied had been previously dried in stoppered museum bottles for periods varying from 5 to 20 years, but still manifested vigorous powers at nitrogen fixation. The latter was in many cases as high as and in some much higher than that of many freshly collected soils known to possess notable powers in that direction."

Usually a high nitrogen content seemed to be unfavorable to vigorous nitrogen fixation, although the highest nitrogen fixation of the 46 soils tested was obtained with a soil containing about 0.3 per cent nitrogen. "It is more generally true that high fixations of nitrogen are accomplished by soils in mannite solutions only when Azotobacter organisms form a part of the same flora. . . .

"Many different forms of *Azotobacter* were observed in those soils possessing that group of organisms. Very frequently one soil showed the presence of two or three different species of *Azotobacter*. *A. chroococcum*, however, was the most prominent of all the species and was found most widely distributed in the several soils.

"In a number of cases the amount of pigment produced by the *Azotobacter* forms was most marked. The organism surpassing all others studied in this respect was a form of *A. chroococcum* in the poor soil from Sinaloa, Mexico.

"Only about half the soils tested showed notable or vigorous gas formation in mannite solution. Only three of these contained *Azotobacter* organisms. Sixteen of them were the highly ferruginous and humus soils obtained from various portions of the Hawaiian Islands. Gas formation in mannite solutions inoculated with soil would, therefore, seem to be largely accomplished by *clostridium* and other rod forms and not by *Azotobacter*. . . .

"Pigment production by cultures ran almost entirely parallel with *Azotobacter* development in them. Thus the total number of cultures producing pigment was 20, only slightly in excess of the number showing *Azotobacter* organisms. Of these 20 all but two gave a brown to black pigment. The other two gave a yellow to orange pigment. Twenty-five of the mixed cultures exhibited more or less membrane formation. In nearly all cases the presence of membranes was due to *Azotobacter* development."

In pure culture studies in mannite solution and sandy soil it was found that on the whole the sandy soil was far superior to the solution as a medium for nitrogen fixation by the several forms of *Azotobacter* studied, since 17 out of 20 organisms added to the soil in every case more than 3 mg. of nitrogen. The latter was accomplished by only 11 organisms in the case of the mannite solutions. Sixteen out of 20 organisms fixed in every case more than 5 mg. of nitrogen per gram of mannite in the soil as a medium, whereas there were but four such in the case of the mannite solution cultures. There were nearly five times as many of the same organisms which fix 6 mg. or more of nitrogen in the soil culture as there were in the case of the solution cultures.

Studies of the relation of soil type to nitrogen fixation by pure cultures of two types of *Azotobacter* showed that the fixation of nitrogen by the two organisms tested was notably smaller in the soils which were their natural habitat than in a totally different type of soil. It is concluded "that the soil type . . . is the determinant above all other factors of an organism's power to fix atmospheric nitrogen."

It was further found that considerable difference existed between the powers of different organisms to use certain carbon compounds in nitrogen fixation.

A final study with 56 soils showed the absence of any general law regulating the ratio of nitrogen present in soils to nitrogen fixation by those soils.

Nitrification and total nitrogen as affected by crops, fertilizers, and copper sulphate, C. A. JENSEN (*Jour. Amer. Soc. Agron.*, 8 (1916), No. 1, pp. 10-22; *ibid. in Chem. Abs.*, 10 (1916), No. 6, pp. 795, 796).—Studies on the changes in nitrification and total nitrogen content of soils under field conditions at Rocky Ford, Colo., during the summers of 1911 and 1912, and on the influence of different cropping and fertilizer treatments on excessive nitrate accumulation in these soils, are reported.

It was found that "the accumulation of nitrates in the soils in the Arkansas River Valley in Colorado . . . in 1910 and 1911 . . . became less in 1912 and 1913. In the work in 1911 mustard appeared to have some effect in checking the accumulation of nitrate in the field. Copper sulphate at the rate of 100 lbs. per acre on fallow was also effective in checking nitrification, reducing the average seasonal accumulation to about 60 per cent of the amount found in

the check plat. Molasses on fallow decreased nitrification about 25 per cent . . . but the molasses-treated plat showed a little more nitrates than the plats cropped to cane and oats. Manure on fallow gave a slightly higher accumulation of nitrates than the fallow check. Waste lime on fallow caused strong nitrate accumulation, being more effective in this regard than any other treatment. In general, active nitrification did not set in until the first part of June. From then until the middle of July it was strongest, and then suddenly decreased and became very feeble until the end of the experiment, August 17, regardless of the field treatments. . . .

"The mustard plat contained less total nitrogen than any of the others. The fallow plats receiving copper sulphate and molasses contained less total nitrogen than the other fallow plats. The fallow plats with waste lime and manure each contained less total nitrogen than the plat fallowed with nothing added. The reverse was true as regards nitrates. In general, there seemed to be an inverse relation between the amounts of nitrates and amounts of total nitrogen. In the work in 1912, in the presence of a vigorously growing beet crop, the only treatments which showed decided increases in nitrification were cyanamid and manure plus ammonium sulphate. Aside from considerable weekly variations, there was not much change in nitrification from the middle of May till the latter part of July, after which the nitrifying activity was very low and remained so until the end of the experiment, August 26.

"Bone meal, superphosphate, waste lime, and dry yard manure decreased the nitrifying activity. Composted manure produced a slightly higher nitrifying activity than did the dry yard manure, but both these plats showed slightly less nitrates than the checks. The total organic nitrogen in the first foot showed a general decrease from the latter part of May to the latter part of August. . . . This decrease was least from the middle of June to the middle of July. There was also a slight loss of organic nitrogen from the second foot during the same period. It is shown that the seasonal loss of organic nitrogen could not be accounted for by the amounts removed in the crop. No correlation could be established between the nitrate content and the total nitrogen. Taking into account the nitrogen applied in the manures and lime, the manured plats lost the most nitrogen, especially those to which ammonium sulphate was added, while the limed plats showed a gain in total nitrogen. The plats receiving cyanamid, phosphatic fertilizers, and nitrate showed a slight gain in total nitrogen over the checks. The total nitrogen content in the second foot was unaffected by the fertilizers applied in the first foot. The nitrifying activity in the second foot was very low."

The use of nodule bacteria for legumes, G. KÖCK (*Die Verwendung von Knöllchenbakterien zu Leguminosen*. Vienna: *Mitt. Pflanzenschutz* [1915], pp. 4, fig. 1).—Several different experiments on the inoculation of *serradella* and lupine crops with nodule bacteria are briefly reviewed, the results of which indicated that the *serradella* usually responded more markedly to treatment than did lupines. The existence of an after-effect of inoculation of the soil was not established. Differences were observed in the results obtained with different types of bacterial culture. It is thought that inoculation is of great importance for certain legumes under German conditions, but that much depends on the condition of the soil and other environmental factors, thus making tests of the process by each farmer advisable to establish its value in a locality.

Recent investigations on the production of plant food in the soil, L. E. J. RUSSELL (*Jour. Roy. Hort. Soc.*; 41 (1915), No. 2, pp. 173-187, figs. 2).—This lecture deals with the physical, chemical, and biological processes involved in

the formation of substances which the plant takes from the soil and utilizes in building up its tissue.

Manurial experiments. G. K. KELKAR (*Dept. Agr. Bombay, Ann. Rpt. Expt. Work Surat Agr. Sta., 1913-14, pp. 23-31*).—Six years' fertilizer experiments with cotton and sorghum are summarized, the results of which are taken to indicate that barnyard manure may well be replaced by rotted cactus, poudrette, tank mud, town sweepings, and mowra refuse.

Experiments with cotton and sorghum on the residual effect of night soil showed that ten years after application superior results were still obtained. Experiments conducted since 1911 comparing the fertilizing value of night soil and poudrette for cotton and sorghum gave results generally in favor of the night soil. Experiments conducted since 1908 to compare the fertilizing values of sodium nitrate, calcium nitrate, ammonium sulphate, calcium cyanamid, and barnyard manure, when applied to cotton and sorghum at the rate of 10 lbs. of nitrogen per acre, showed that for cotton sodium nitrate and calcium nitrate gave the best results, while for sorghum ammonium sulphate and the other artificial fertilizers gave as good results as sodium nitrate.

Experiments with cotton comparing the fertilizing value of a combination of 80 lbs. of calcium nitrate and 160 lbs. of superphosphate per acre, with and without 2.4 tons of barnyard manure per acre, and with barnyard manure alone applied at the rate of 8 tons per acre, showed that the best results were obtained with the combination of artificial fertilizers without manure. The results with manure alone and with manure and the artificial mixture were approximately equal.

Experiments with cotton and sorghum showed that neither of these crops responded to nitrogenous, phosphatic, or potash fertilization on black cotton soil. Experiments with cotton and sorghum comparing barnyard manure alone, used at the rate of 3 tons per acre, and a combination of 60 lbs. of ammonium sulphate, 224 lbs. of superphosphate, and 1.5 tons of manure per acre with and without 80 lbs. of potassium chloride per acre, showed that the best results were obtained with cotton with the mixture without potash. The difference in results obtained with the mixture with potash and with manure alone was slight.

Report on field fertilizer experiments at the Bernau moor cultivation station. A. BAUMANN and H. PAUL (*Mitt. Deut. Landw. Gesell., 30 (1915), Nos. 42, pp. 627-639; 43, pp. 651-653; 45, pp. 686-688*).—The classified results of four years' experiments with nitrogenous, phosphatic, and potash fertilizers, stable manure, green manure, and lime on an upland moor soil deficient in both nutritive constituents and lime are reported. The cropping system consisted of potatoes, followed in the third or fourth year by rye, which was then followed by meadow or pasture.

A half-and-half mixture of 40 per cent potash salt and potassium-magnesium sulphate was the best potash fertilizer used, giving even better results than the 40 per cent potash salt alone. Phonolite meal was unsuitable as a potash fertilizer for this soil. Wolters sodium phosphate gave on the average the best results of the phosphates used, being better than bone precipitate. Of the nitrogenous fertilizers used, sodium nitrate gave the best results, followed in order by calcium nitrate, lime nitrogen, and ammonium sulphate. Of these, ammonium sulphate produced the greatest increase in the starch content of potatoes.

Stable manure used at rates of 300 and 400 kg. per hectare (267 and 356 lbs. per acre) produced greater crop increases than smaller applications of 200 to 300 kg. per hectare. The increases were small, however, as compared to those

by sodium nitrate, and the influence on starch content was not very marked. In the green manuring experiments the best results were obtained when the green matter and roots were used together with sodium nitrate. Better results were obtained with green matter and roots together than with green matter or roots used with sodium nitrate. Liming produced generally favorable results in these soils, although nitrogen assimilation and the starch content of crops were not markedly influenced. The starch content of potatoes was higher when lime was used alone than when used with a basal fertilizer.

Pot culture experiments, 1914. J. A. VOELCKER (*Jour. Roy. Agr. Soc. England*, 75 (1914), pp. 306-322, pls. 6; *Woburn Expt. Sta. Rpt. 1914*, pp. 23-39, pls. 6; *abs. in Jour. Bd. Agr. [London]*, 22 (1915), No. 4, pp. 353, 354).—Experiments on the influence of sulphate, phosphate, carbonate, nitrate, and arsenite of copper on wheat in a relatively rich soil are reported. The results are taken to indicate that sulphate of copper has an injurious effect when used in a quantity supplying 0.05 per cent of copper or more, but that 0.02 per cent of copper or less can safely be used in this form and has a slightly stimulating effect. Phosphate of copper has a generally stimulating influence and can be used in quantities supplying up to 0.1 per cent of copper without producing any toxic effect on the plant. Carbonate of copper is nearly as harmful as sulphate of copper when used in quantities approaching 0.1 per cent of copper. With 0.05 per cent the effect is doubtful, but 0.02 per cent or less has, when used in the form of carbonate, a stimulating influence. Nitrate of copper when supplying 0.02 per cent of copper or more is distinctly harmful, but when used in less amounts has a stimulating influence. Arsenite of copper is very harmful, and even so small a quantity as 0.05 per cent of copper in this form may be toxic in its effects.

Experiments on the influence of the phosphate, carbonate, nitrate, sulphate, and chlorid of lead on wheat showed that "in no case was there any sign of injury, although lead had been used up to 0.1 per cent. The general result was to point, on the whole, to a stimulating effect rather than the reverse. This was especially marked with the phosphate series and the nitrate one. With the carbonate and sulphate the results were very similar to the untreated and with the chlorid the straw seemed to be somewhat reduced. . . . Therefore lead can be used with impunity up to 0.1 per cent with any of the salts employed."

Experiments on the effects of adding lime to a soil rich in magnesia showed "that addition of lime to a soil rich in magnesia is beneficial and can be applied without detriment even to an extent where the lime is double the amount of magnesia present in the soil."

Soil-acidity experiments on soil continuously cropped to barley led to the conclusion "that where soil acidity has gone to the extent that a crop can not be produced, lime as carbonate of lime may advantageously be added to an extent exceeding that required to neutralize the acidity present, but that where acidity may be indicated but a fair crop be still produced, there is no advantage from adding lime as carbonate of lime even to the neutralizing point. Lastly, when no acidity is shown, further liming is thrown away." In no case did the use of calcium carbonate produce the harmful effects produced by caustic lime.

Experiments with mustard, barley, peas, and tomatoes to determine the influence of inoculating soil with Bottomley's peat preparation led to the conclusion that "the peat preparation exercised a distinct influence upon the vegetation. The results with barley, peas, and mustard, coupled with those on the vegetative growth of the tomatoes, clearly show that there is something effected by the peat and that this is due not to the chemical composition alone."

The Illinois system of soil fertility from the standpoint of the practical farmer, BROTHER LEO (*Illinois Sta. Circ. 186 (1916), pp. 3-8*).—This is an address before the Illinois Farmers' Institute at Decatur, February 22, 1916, in which a popular discussion of the well-known Illinois system of soil fertility is given together with an account of the successful use of this system on the farm of the University of Notre Dame.

The use of fertilizers in 1916, W. P. BROOKS (*Massachusetts Sta. Circ. 59 (1915), pp. 8*).—This circular gives the substance of the points agreed upon at a conference of the directors of the New York, New Jersey, and New England stations, with the addition in a few cases of conclusions based chiefly upon results of experimental work at the Massachusetts Station.

Growing crops without potash in 1916, C. D. Woods (*Maine Sta. Doc. 520 (1915), pp. 15*).—This is an address delivered before the Maine Seed Improvement Association, December 8, 1915, which is based in part upon the conclusions reached at a meeting of the directors of the New England, New Jersey, and New York stations and in part on special studies made by the Maine Station.

The action of new nitrogenous fertilizers, GERLACH (*Mitt. Deut. Landw. Gesell., 31 (1916), No. 7, pp. 90-93*).—Pot experiments with oats and white mustard on weak humus loamy sand and loamy sand, plat experiments with oats, rye, and wheat on loamy sand, and field experiments with beets, barley, and rye on loamy sand and light loamy sand soil are reported, the purpose of which was to determine the relative fertilizing action of sodium nitrate, lime nitrogen, urea, urea nitrate, ammonium sulphate, ammonium chlorid, ammonium bicarbonate, ammonium sodium sulphate, and an organic nitrogenous fertilizer.

It was found that under the favorable conditions existing in the pot experiments, lime nitrogen and urea showed a fertilizing action approximately equal to that of the ammonium and nitrate fertilizers. In the field experiments, and especially on light soils, the opposite was frequently the case. Urea usually gave better results than lime nitrogen. The lime nitrogen gave, in general, relatively unfavorable results and it is thought that field experiments of long duration with it and urea are necessary to determine the conditions for their best utilization. Urea nitrate, while not generally giving the same results as urea, is considered a valuable fertilizer. Ammonium chlorid and ammonium sodium sulphate gave as good results in pot cultures as ammonium sulphate, but the results of field experiments with these two fertilizers were unfavorable. Ammonium bicarbonate did not give as good results as the other fertilizer salts, especially on sand soils. The least favorable results were obtained from the organic fertilizer. No injurious action by any of the fertilizers was observed.

Phosphates and honesty, C. G. HOPKINS (*Illinois Sta. Circ. 186 (1916), pp. 3-11*).—This is an address before the Illinois Farmers' Institute at Decatur, February 22, 1916, consisting of a summary of results of experiments at a number of the state agricultural experiment stations on the use of phosphatic fertilizers from which it is concluded "that where phosphorus is deficient in the soil it must be applied in order to increase and permanently maintain fertility or productive power. At moderate prices either bone meal, acid phosphate, basic slag phosphate, or fine-ground natural rock phosphate may be used with profit. When prices are sufficiently low, the more readily available phosphates are probably best, especially for garden crops or on soils which are deficient in decaying organic matter, or when the cost of raw phosphate is prohibitive; but even for garden crops, and also in beginning soil improvements for general farm crops even before adequate supplies of organic matter can be provided, liberal applications of raw phosphate may well be used when exorbitant prices are charged for other phosphates."

Certain factors which influence the fertilizing action of the slightly soluble phosphates, H. G. SÖDERBAUM (*K. Landbr. Akad. Handl. och Tidskr.*, 54 (1915), No. 5, pp. 448-477, figs. 7; *Meddel. Centralanst. Försöksr. Jordbruksområdet*, No. 112 (1915), pp. 35, figs. 7; *abs. in Chem. Abs.*, 9 (1915), No. 23, p. 3319).—Pot culture experiments with oats, barley, rye, and wheat on soils deficient in both nitrogen and phosphoric acid to determine the influence of the carbonate and sulphate of magnesium, sodium nitrate, ammonium sulphate, and organic nitrogen on the fertilizing action of superphosphate, Thomas slag, dicalcium phosphate, tricalcium phosphate, bone meal, Algerian phosphate, and apatite are reported.

Previous experiments on the influence of lime on the slightly soluble phosphates are reviewed, which showed that while the addition of lime to the readily soluble phosphates had no marked influence upon their fertilizing action, that of the less soluble phosphates was inhibited. With a low lime content in the soil either type of phosphate was used to advantage, but with a high lime content the insoluble phosphates gave no favorable results.

In the present experiments it was found that when using superphosphate a larger crop yield was obtained with ammonium sulphate than with sodium nitrate, but when using tricalcium phosphate the opposite was true. The results varied with the crops, wheat being more sensitive than the others. When using dicalcium phosphate little difference was observed in the action of the two nitrogen compounds. With the less soluble phosphates ammonium sulphate and organic nitrogen proved superior to sodium nitrate, except with barley, with which ammonium sulphate and organic nitrogen always gave a poorer crop than sodium nitrate, regardless of the type of phosphate used. When magnesium sulphate was used with the readily soluble phosphates, little influence was observed on crop growth, regardless of the form of nitrogen used, but when magnesium carbonate and ammonium sulphate were used with readily soluble phosphates a distinctly increased yield was obtained. With the less soluble phosphates, magnesium sulphate gave slight and conflicting results, and the results obtained with magnesium carbonate varied with the plant, the yield of rye and wheat being increased and that of barley and oats slightly decreased.

Displacement of the potash and phosphoric-acid contents of certain rocks by some fertilizers, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris]*, 162 (1916), No. 3, pp. 133-136; *abs. in Rev. Sci. [Paris]*, 54 (1916), I, No. 3, p. 94).—Experiments conducted along lines similar to those with feldspar, previously noted (E. S. R., 30, p. 126), are reported in which glauconite containing 7.08 per cent potash was subjected to the action of calcium carbonate, sodium chloride, sodium carbonate, ammonium sulphate, and calcium sulphate in the presence of water, using 1 gm. of the salts to 10 gm. of glauconite. It was found that the salts in the order mentioned dissolved 3.24, 5.67, 5.62, 7.17, 9.97, and 5.56 per cent of the total potash content of the glauconite. These results are said to be greater than those obtained with feldspar.

In further experiments with apatite, using ammonium carbonate, sodium nitrate, potassium nitrate, and potassium carbonate, it was found that ammonium carbonate and the nitrates failed to displace any appreciable amount of phosphoric acid. Potassium carbonate displaced about 0.35 per cent of the phosphoric-acid content of the apatite.

Feldspar as a possible source of American potash, A. S. CUSHMAN and G. W. COGGESHALL (*Trans. Amer. Inst. Chem. Engin.*, 7 (1914), pp. 184-202).—In a second contribution to the subject (E. S. R., 27, p. 724), the authors report additional investigations which were conducted with the idea of separating and

concentrating the soluble potash salts made available by the process previously noted. The process developed has been previously described by Coggeshall (E. S. R., 34, p. 27).

The results of a comparison of the product with imported German muriates are taken to indicate that "without any attempt at fractional separation, muriate of potash may be made from American feldspars equal in character to the usual imported muriates, and that they are as well adapted to be used in commercial mixed fertilizers as those imported." After a further comparison and discussion of costs of plant and operation, it is stated that "if 80 per cent muriate of potash has been heretofore used at a cost in this country of \$37.50 per ton, there is shown a saving by the above process of over \$6 per ton, or 20 per cent profit on the manufacturing cost."

Potash from fir wood mill waste. H. F. ZOLLER (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 195-198).—Analyses of Douglas fir and cedar ashes are reported, the results of which, together with other general considerations, are taken to indicate "that it is possible to obtain potash, calculated as K_2O , from Douglas fir mill waste incinerators in the amounts of from 10 to 20 lbs. per ton of 'ash' employed. Furthermore, that this potash may be obtained, along with other extractable matter, by merely leaching the ash in suitable vats with hot water for a 24-hour period and in all probability a 12-hour period would be as efficient."

Potash from kelp: A record of handling kelp in commercial large-scale operation, I. F. LAUCKS (*Metallurg. and Chem. Engin.*, 14 (1916), No. 6, pp. 393-398, figs. 6).—This is a record of a trial of large scale kelp handling operations, confined entirely to the species *Nereocystis luetkeana* of Puget Sound, including methods and cost of harvesting, transporting, and drying.

It is stated that this type of kelp contains an average of between 92 and 93 per cent water. "The cheapest and most satisfactory type of conveyor is the chain conveyor with wooden flights and either double or single chain. . . . The direct-heat rotary drier appears to be the most satisfactory type."

The composition and use of certain seaweeds. J. HENDRICK (*Jour. Bd. Agr. [London]*, 22 (1916), No. 11, pp. 1095-1107).—A summary of analyses of a large number of samples of the common seaweeds and their ash collected from different points on the coast of Scotland is given. The following table shows the percentages of ash and of potash in the ash of the different seaweeds:

Ash and potash of seaweeds.

Kind of seaweed.	Ash in weed as received.			Potash in ash.		
	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.
<i>Laminaria digitata:</i>						
Stems.....	8.19	4.78	6.32	35.62	20.10	28.71
Fronds.....	10.46	3.75	5.66	26.55	16.80	20.99
<i>L. sacculigera:</i>						
Stems.....	6.15	5.56	5.78	39.21	27.07	33.60
Fronds.....	5.22	4.31	4.66	22.03	17.47	20.21
<i>L. vesiculosus:</i>						
Fronds.....	9.06	4.66	6.53	20.82	12.35	15.29
<i>L. hyperborea:</i>						
Fronds.....	8.02	5.52	6.35	14.88	9.47	12.22
<i>L. teretis:</i>						
Fronds.....	6.94	4.88	5.49	20.76	16.71	18.60

The fertilizing action of sodium chlorid. B. SCHULZE (*Landw. Vers. Stat.*, 56 (1915), No. 5-6, pp. 323-330; *abs. in Chem. Zentralb.*, 1915, II, No. 5, p. 289; *Beitr. Angew. Chem.*, 28 (1915), No. 65, *Referatteil*, p. 421; *Jour. Chem. Soc. [London]*, 108 (1915), No. 634, I, p. 767).—Pot experiments with mustard on a

soil poor in potash and on a mixture of loam soil and sand to determine the extent of the action of common salt in setting free the potash from an artificial potassium zeolite are reported. The results are taken to indicate that common salt solution does not have a solvent effect on potassium zeolites, and that if an increase in crop is obtained by fertilizing with common salt it can not be attributed to the indirect effect of the salt in setting free the potash of potassium zeolites in the soil. It is further concluded that sodium may act directly as a nutritive element for some plants.

Bat fertilizers, C. N. AGETON (*Estac. Expt. Agron. [Cuba], Informe An.*, 3 (1909-1914), pp. 92-97).—Analyses of 37 samples of bat guano from Cuba are reported and discussed.

Notes on the chemical composition of Karroo ash, C. F. JURITZ (*So. African Jour. Sci.*, 12 (1915), No. 4, pp. 133-142).—A number of miscellaneous analyses of kraal manure and the burned manure ash from stock-raising districts of South Africa are reported. A summary of analyses of 29 samples of the ash showed average contents of potash 9.85, lime 21.81, and phosphoric acid 2.86 per cent.

Fertilizer analyses, A. J. PATTEN, O. B. WINTER, O. F. JENSEN, and E. F. BERGER (*Michigan Sta. Bul. 275* (1915), pp. 3-25).—This bulletin contains the results of actual and guaranteed analyses of 358 samples of fertilizers and fertilizing materials representing 300 brands offered for sale in Michigan during 1915. Of these 21 were below guaranty in nitrogen, 19 in available phosphoric acid, 5 in total phosphoric acid, and 33 in potash.

Tabulated analyses of commercial fertilizers and fertilizer materials, J. W. SAMPLE (*Tenn. Dept. Agr. Fert. Bul. 1915*, pp. 61).—This bulletin contains the results of actual and guaranteed analyses of 376 samples of fertilizers and fertilizing materials collected for inspection in Tennessee during 1915, together with general information for farmers on the use of fertilizers and the text of the state fertilizer inspection law.

Commercial fertilizers, inspection 1915, B. H. HIRE and F. B. KUNST (*West Virginia Sta. Insp. Bul. 4* (1916), pp. 69).—This bulletin contains the results of actual and guaranteed analyses of 332 samples of fertilizers and fertilizing materials collected for inspection in West Virginia during 1915, together with a discussion of the fertilizer situation, inspection work, etc.

AGRICULTURAL BOTANY.

Agricultural bacteriology, H. L. RUSSELL and E. G. HASTINGS (*Madison Wis.: H. L. Russell, 1915*, pp. VI+304, figs. 48).—The present edition (E. S. R., 22, p. 723) treats of the properties of micro-organisms, soil bacteriology, the relation of micro-organisms to foods, and transmissible diseases. One chapter deals with bacterial diseases of plants.

Determining types of genera, O. F. COOK (*Jour. Wash. Acad. Sci.*, 6 (1916), No. 6, pp. 137-140).—This is a discussion of the need for a stable taxonomy in both branches of biological science and the difficulties to be overcome in working out a practicable system.

Physiological temperature indices for the study of plant growth in relation to climatic conditions, B. E. LIVINGSTON (*Physiol. Researches*, 1 (1916), No. 8, pp. 399-420, figs. 4; *abs. in Science*, n. ser., 43 (1916), No. 1106, p. 362).—This publication deals with the derivation and use of a series of physiological indices of temperature efficiency for plant growth, these indices being derived from data obtained by Lehenbauer in a study of the relation of temperature to the elongation rate in seedling maize shoots (E. S. R., 32, p. 334). The system

is said to differ from others in that it is based on actual physiological experimentation, it takes account of the general principle of temperature minima, optima, and maxima, and it shows a much greater rate of increase for the index value with rising temperature between 35.6 and 89.6° F. (2 to 32° C.) than does either of the other systems to which, on whole, it is considered preferable.

By the use of these new indices, physiological summation indices of temperature efficiency for plant growth have been obtained for many stations in the United States, and these have been charted to give a new temperature zone map of the country. It is thought that the physiological system of indices gives the nearest approach yet made to a true expression of the relation of temperature to plant growth.

Acacia seedlings, R. H. CAMBAGE (*Jour. and Proc. Roy. Soc. N. S. Wales*, 49 (1915), pt. 1, pp. 81-121, pls. 5, figs. 5).—The author gives details obtained by him in the study of species of *Acacia* as met with in Australia, where members of this genus show various forms and degrees of variation of the several parts, presumably under the influence of the peculiar conditions there prevailing.

Multiple leaves in clover, J. PERRIBAZ (*Bul. Soc. Vaud. Sci. Nat.*, 5. ser., 50 (1914). No. 182, pp. 15-22, fig. 1).—The author concludes a discussion of his observations by stating that the appearance of supplementary leaflets in the different species of clover is due to heredity or to nutritive factors. These may be distinguished, as the latter appear on the same plan as the normal growth while the former appear on a different plan.

Variations in flowers of Iris, R. PIRROTTA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 24 (1915), I, No. 9, pp. 897, 898).—Discussing the appearance in *Iris* flowers of flecks, spots, or lines, which in some cases were even showy, varying in form, size, number, and position, or sometimes lacking in successive seasons, the author mentions his more recent observations of other variations, which are as yet incomplete.

On the inheritance of the flowering time in peas and rice, Y. HOSHINO (*Jour. Col. Agr. Tohoku Imp. Univ.*, 6 (1915), No. 9, pp. 229-288, pls. 5).—Since 1907 the author has carried on genetical studies with rice and peas, his work bearing upon the theory of a multiple factor.

It is claimed that his experimentation has demonstrated the fixity of the character of flowering time in the original varieties of peas and the presence of two pure lines in the population of one variety. Flowering time in the *F₁* generation inclines toward the late parent in peas, toward the early one in rice. The variation range of *F₂* families covers the combined range of both parent varieties, but their variation type is not the ordinary one. The inheritance of flowering time follows the Mendelian law in the *F₂* and *F₄* generations. As an explanation of the inheritance of flowering time in peas, the author suggests the presence of two Mendelian factors which differ in their effects, and genetic contamination caused by hybridization whose nature is not yet explainable. From a study of the variation types in peas, it is thought that the hereditary difference of the two pure lines is qualitative and not quantitative. A correlation is noted between flowering time and flower color in peas, which is thought to be explainable by assuming gametic coupling between the color factor and one of the two factors for flowering time.

A bud variation of the scarlet runner, J. REINKE (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 7, pp. 324-348).—An account with discussion is given of the appearance in 1913 of a strain of *Phaseolus multiflorus*, some of the upper inflorescences of which bore white corollas, also further observations upon phases of development and heredity in the progeny.

Amphiclinous hybrids, H. DE VRIES (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 8, pp. 461-468).—The author has found that the crossing of *Oenothera lamarckiana* with *O. lamarckiana nanella* gives, according to cultural conditions, from 0 to 90 per cent of dwarfs in the progeny. The percentage is usually below 50 per cent in the progeny of the first year, but above that figure in that of the second. These figures may be raised by early planting or abundant water supply during the period of root formation. The percentage of dwarfs in the progeny is thus not constant, depending greatly upon cultural conditions.

Recent mutations of Solanum commersonii, LABERGERIE (*Rev. Vit.*, 38 (1915), No. 1117, pp. 406, 407).—An account is given of the sudden appearance in 1914 of two mutants, which are described, in the progeny of two plants of *S. commersonii* grown for several years in contact with a domestic variety of potato. The phenomena noted are compared with those reported by Planchon (E. S. R., 28, p. 130) and Heckel (E. S. R., 33, p. 222). It is suggested that solar illumination may be a factor in such cases.

A case of leaf etiolation due to cold, G. GASSNER (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 8, pp. 478-486, pl. 1).—Studies previously reported by the author, partly in connection with Appel (E. S. R., 19, p. 345), have been followed up with tests of the aftereffects of low temperatures on germinating oats. Plants germinated at from 1 to 2° C., as compared with those sprouted at 5 to 6° or 20°, remained pale and backward in growth under favorable conditions of heat and light.

Experimental production of tuberous growth at the expense of the root in potato, M. MOLLIAARD (*Compt. Rend. Acad. Sci. [Paris]*, 161 (1915), No. 18, pp. 531, 532).—The author produced in potato seedlings grown in tightly closed tubes tuberous development containing starch on the lower part of the stem, apparently at the expense of other portions of the plant. These conditions showed marked contrast with those in plants similarly kept, except that air was freely admitted.

The question of a physiological unity constituted by a leaf with its internode, J. KUIJPER (KUYPER) (*Arch. Suikerindus. Nederland. Indië*, 23 (1915), No. 34, pp. 1285-1288, fig. 1).—The question regarding a possible physiological unity constituted by the leaf blade, the leaf sheath, and the internode having arisen in the course of previous work (E. S. R., 34, p. 627), the author has investigated different varieties of sugar cane. From this work he has concluded that the view of a purely local physiological influence in case of a given leaf is not supported by the evidence obtained.

Contributions to the physiology of stomata in Saccharum officinarum. J. KUIJPER (KUYPER) (*Arch. Suikerindus. Nederland. Indië*, 23 (1915), No. 44, pp. 1673-1700, pl. 1).—Studies previously noted regarding stomatal structure in sugar cane (E. S. R., 34, p. 628) have been followed up with investigations of the influence on stomatal behavior of light, temperature, and humidity.

It is stated that while direct sunshine is very effective in causing the stomata to open, darkness causes them to close, although in prolonged darkness the stomata sometimes open to a very small but constant degree. In moderate illumination from a clouded sky, the stomata open slowly and slightly as compared with the behavior in strong sunshine, sunny mornings appearing to be valuable from the standpoint of cane culture. When temperatures of from 1 to 45° C. (109.4 to 112° F.) were produced by the absorption of sunshine by a dark cloth covers the stomata were opened by the heat, but when a sheet was provided the stomata closed normally as in darkness. So far as it was possible to ascertain the influence of air humidity free from complication by other factors, a high humidity of the air appears to increase stomatal opening.

The morning rate of penetration is greater than the afternoon rate in every variety, but the hour of closing and the difference between maximum and minimum opening differ with the variety. The author thinks that early closing may be a profitable feature for the plant on account of a more economical water balance.

It is thought that, while many facts referred to periodicity may be explained by the influence of light, temperature, and water content, there are still some indications that after a prolonged period of darkness, the stomata tend to open between 8 and 10 a. m., suggesting a tendency to periodicity.

Observations on transpiration in sugar cane, J. KULPER (KUYPER) (*Arch. suikerindus. Nederland. Indië*, 23 (1915), No. 45, pp. 1715-1733, pl. 1, fig. 1).—The work above reported was followed up with experiments on transpiration in connection with the movements of the stomata and accompanying water loss in sugar cane. Fresh stalks from six to nine months old were cut in the early morning and placed in large bottles of water the surface of which was protected from evaporation by a layer of oil.

Abundant watering of the plants approximately doubled the amount of water ordinarily transpired. The daily course of transpiration in different varieties permits their arrangement into three groups, two of these attaining their maxima respectively in early morning and at 11 o'clock, while those of the third group show very small differences during the whole day. These differences in the utilization of available water are supposed to correspond to differences in production and in resistance to drought.

The daily loss of weight in one variety may double that in another. No connection was established between transpiration rate and stomatal count of leaf area. The maximum transpiration rate may be reached after the stomata have begun to close, the rate of transpiration being in a measure independent of stomatal behavior. Decrease or deprivation of light decreases transpiration. The varietal differences in transpiration rate are thought to be important as giving a new basis for the selection of canes for certain conditions of soil and climate.

Sap ascent, A. MAILLEFER (*Bul. Soc. Vaud. Sci. Nat.*, 5. ser., 50 (1914), No. 182, pp. 23-30).—It is thought that the amount of energy due to transpiration of water evaporated, 15.1 kilogrammeters per kilogram, is insufficient to account for the observed facts of sap ascent, and that the living cells of the wood must also play a part.

A new theory of gum flow, P. SORAUER (*Ztschr. Pflanzenkrankh.*, 25 (1915), No. 2, pp. 71-84; 3, pp. 133-154, figs. 6).—As a result of later studies (E. S. R., 27, p. 851) on the characters and behavior of cells and tissues in plants showing gum flow, the author states that cultivated cherry trees belong to one of those families which show considerable tendency to liquidation of certain portions of their cell membranes due to reactions in various stored substances. This tendency may often be noted in very young branch tips which may show cell deterioration or gummosis. The conditions for gummosis here existing do not necessarily result in its appearance, often having only symptomatic significance and showing on examination merely more or less predisposition thereto.

It appears that gummosis is primarily a condition of local plethora or a storing of material which, on account of its richness in hydrolyzing enzymes, can not develop into normal cell tissue. This condition manifests itself through the coloration of certain cells and may be related in its development to weather and nutritive conditions.

The artificial absorption of liquids by aerial parts of plants, C. ACQUA (Atti R. Accad. Lincei, *Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 28 (1914), II, No. 9, pp. 78-84).—Experiments are described leading to the conclusion that

plants can easily take up substances in solution, either by means of their leaf surfaces or through cut ends of branches, the latter method entailing comparatively slight injury. While some plants are said to resist for a longer time seasonal or abnormal tendencies under the influence of absorbed solutes, it is thought that no very important alterations of the general condition of the plants can be produced in this way at the present time. It is believed, however, that these methods may be employed in the study of some important agricultural problems.

Albuminous bodies in cells as ergastic substances, A. MEYER (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 7, pp. 373-379).—This is a preliminary discussion of the author's conception of dissolved or ultramicroscopic substances or bodies as a reserve at the disposal of the working portions of the cells.

The physiological theory of chlorophyll, E. G. PRINGSHEIM (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 7, pp. 379-385).—This is largely a discussion of the contributions by Iwanowski (E. S. R., 33, p. 824) on a physiological theory of chlorophyll.

Artificial hastening by pressure of water absorption by seeds, H. DE VAES (*Biol. Centbl.*, 35 (1915), No. 4, pp. 161-176).—On account of the slow and partial germination of the seeds in testing for mutation, involving the danger of loss of possible forms, the author attempted to overcome the difficulty by subjecting the seeds to pressures of from 6 to 8 atmospheres for 2 or 3 days.

It was found that the rate of germination was largely increased, approaching, or in some cases reaching, 100 per cent. It is thought that the effect of pressure is to force the water into the interstices from which it is ordinarily excluded by air spaces or bubbles.

The action of hydrogen ions and some anions on the germinative period of *Avena sativa*, F. PLATE (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 23 (1914), II, No. 5, pp. 168-171).—Reporting studies related to those previously noted (E. S. R., 33, p. 727), and testing the influences of common acids on the growth of *A. sativa*, the author states that both cations and anions exert influences which are chemically and biologically distinct. The hydrogen ion is localized and exerts its influence mainly in the roots, and the anion is localized and exerts its influence in the region of the growing points.

Studies on the influence of the chlorids on the germinative period of *Avena sativa*, F. PLATE (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 23 (1914), II, No. 6, pp. 234-238).—In continuance of the studies reported above, but employing chlorids in solutions of different strengths, the author details the effects thereby produced on growth. An arrangement is made of alkaline nitrates and chlorids in two series according to their observed effects on the total weight of the plant, growth of root, growth of shoot, correlation of development, and atomic weights of the positive elements employed.

It is stated that the kind of anion present has a certain influence upon the action of the cation employed when the action of the latter is not toxic to the plant. If the cation is decidedly toxic, this toxicity is maintained whatever anion may be employed.

Hydrocyanic acid formation in the germination of seeds, III, IV, C. RAVENNA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 23 (1914), II, No. 6, pp. 222-226; 7, pp. 302-306).—In pursuance of reports on studies carried out in connection with others (E. S. R., 24, p. 534; 27, p. 122), the author gives an account of the methods employed and the results obtained in a study of hydrocyanic acid in germinating seeds of *Phaseolus lunatus*. An augmentation of that component was noted in the early period of germination, but this was followed by a diminution.

Experiments on the physiology of indigo-yielding glucosids. F. R. PARNEU (Item. Dept. Agr. India, Bot. Ser., 7 (1915), No. 5, pp. 195-212).—Giving details of a study on parts of several plants, the author states that an indigo-yielding glucosid is present in the roots and seeds of *Wrightia tinctoria* and of *W. tomentosa*, but not in the leaves of the latter. The glucosid and its enzym in *W. tinctoria* are distinct from those of *Indigofera arrecta* and *I. sumatrana*. The glucosid content in *W. tinctoria* seed germinated and grown without nitrogen supply increases to about 300 per cent in about 40 days, but it decreases considerably as nitrogen starvation progresses. *W. tomentosa* seedlings show no appreciable increase of glucosid under like conditions. In cuttings of *Polygonum tinctorium* and *Strobilanthes flaccidifolius* grown without nitrogen part of the glucosid disappears, presumably being used up as a nitrogenous reserve. In *W. tinctoria* and *I. arrecta* the maximum percentage content occurs very early in the leaf development, the actual amount in any leaf increasing during growth to maturity and then remaining constant until after the leaves fall.

Indican is produced in the dark by etiolated shoots of *I. arrecta*. There is no variation in indican content between night and day in *I. arrecta* and *I. sumatrana*, and no marked change is observable after keeping *I. sumatrana* in the dark for 36 hours.

No definite function is assigned to indigo-yielding glucosids in general or to those of any particular species.

Cytological observations on the mode of formation of anthocyanin pigments in flowers. A. GUILLIERMOND (Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 17, pp. 494-497).—Referring to the recent work of Moreau (E. S. R., 33, p. 523) as confirmatory of his own views previously noted (E. S. R., 30, p. 729), the author gives a résumé of the results of his own studies during 1914 and 1915.

It is stated that in the flower of canna, the formation of anthocyanin involves a process identical with that observed in leaflets of rose. Observations on *Pelargonium zonale* and *Iris germanica* are also described. In the latter the formation of anthocyanin presents two phases which are discussed. These studies are held to confirm the conclusion previously reached by the author and by Moreau that anthocyanin is formed in flowers exactly as it is in leaves.

The coloring matters of chromatophores. H. KYLIN (Naturw. Wehnschr., 31 (1916), No. 7, pp. 97-103, figs. 8).—Noting results of studies on the color constituents in higher plants and algae, the author discusses their properties and their probable significance in connection with the activities of the plants.

Alkaloid formation in plants.—I. Studies on protein and nicotine content during growth, H. B. RASMUSSEN (Biochem. Ztschr., 60 (1915), No. 5-6, pp. 491-496).—These studies, carried out with *Nicotiana rustica* and with Hungarian and Virginia varieties of tobacco, show no clear and constant relation between the richness of the fertilizers used and the nicotine content of the resulting plants, but they do show an increase of nicotine with the age and growth of the plants. The total nitrogen varied during growth according to the variety of the plant and the situation of the leaves tested. In the less strongly manured plants, the total protein nitrogen decreased with their age. In the more heavily manured, the autumn content was greater than that of August.

The morning and evening content of mulberry leaves. L. PICORINI (Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), II, No. 9, pp. 483-487).—Analyses of mulberry leaves are said to have shown that in sunlight such leaves increase from morning to evening their content of organic

substances, including carbohydrates, fats, and both proteid and nonprotein nitrogenous materials, furnishing thus a greater amount of nutritive matter in the latter part of the day.

Plant enzymes.—IV, Invertase of potato leaves, G. DOSY (*Biochem. Ztschr.*, 71 (1915), No. 6, pp. 495-500).—Continuing previous work (E. S. R., 34, p. 428), the author has studied the activity of the enzymes obtained from comminuted potato leaves as found in their expressed juices.

The activity of the enzymes contained in the juices as obtained by hand pressure diminished sensibly after the material had been kept for 24 hours. Those obtained by pressures of 100 and 300 atmospheres showed successively lessened enzym activity. It is considered probable that the decreased activity is due partly to a diminution of the enzymes in the juices obtained at higher pressure, but also perhaps to a rapid breaking down of the enzymes themselves.

A note on the occurrence of urease in legume nodules and other plant parts, M. S. BENJAMIN (*Jour. and Proc. Roy. Soc. N. S. Wales*, 49 (1915), pt. 1, pp. 78-80).—The author states that, having detected the presence of an enzym capable of splitting urea in the nodules of *Trifolium agrarium*, *T. minus*, *Pisum arvense*, *Vicia dosciacarpus*, *V. sativa*, *Glycine clandestina*, *Acacia decurrens*, *A. falcata*, *A. juniperina*, *A. linearis*, *A. lunata*, *A. pumila*, *A. suaveolens*, *Aotus villosa*, *Daviesia genistifolia*, *Lathyrus latifolius*, and *Cytisus proliferus*, but not in those of *Medicago sativa*, *M. denticulata*, *M. maculata*, or *Trifolium repens*, he has extended his study to other parts of plants. A reaction for the presence of the enzym was given by seeds of *Cucumis melo*, *Cucurbita moschata*, and *Abrus precatorius*. Other plant parts giving a reaction for urease were the ovules and pollen of a *Hippeastrum*, the tubercles, roots, and bulbs of *Macrozamia spiralis*, and the dried, immature leaves of a *Wistaria*. The reaction proper to the enzym was obtained from a red and a green alga, and it was particularly pronounced and rapid in case of the lichen *Ramulina yemensis*, *Xanthoria parietina*, and *Usnea barbata*.

Although no conclusions are drawn as to the part played by this enzym in the economy of plants, the fact that it has been detected in parts in which symbiosis occurs and in other parts in which active metabolic changes are doubtless in progress, as in pollen, ovules, young leaves, etc., suggests some correlation between its presence and the processes of elaboration and interchange of nutritive material which must be constantly occurring in the living plant.

A new nitrite-forming organism, N. V. JOSHI (*Mem. Dept. Agr. India, Bact. Ser.*, 1 (1915), No. 3, pp. 85-96, pls. 2, fig. 1).—An account is given of the discovery and study of a nitrite-forming organism, with an outline of its reactions to temperature, chemical agents, and nutrient preparations.

The influence of ultraviolet rays on reproductive organs of plants, L. MONTEMARTINI (*Atti Ist. Bot. R. Univ. Parma*, 2. ser., 9 (1911), pp. 13-23).—In these experiments, carried out with several plants named, the author was not able to discover any specific action of ultraviolet rays on the reproductive organs of the plants tested.

FIELD CROPS.

Experiments on the influence of selection, C. FRUWIRTH (*Ztschr. Pflanzenzicht.*, 3 (1915), Nos. 2, p. 173; 4, pp. 395-451, figs. 5).—The experiments here described were conducted with white mustard (*Sinapis alba*), oats, and certain leguminous plants.

The results obtained with six Johannsen lines of white mustard, producing yellow and brown seeds and sometimes both kinds on the same plant, showed

that continuous selection of either the yellow or the brown seeded forms failed to establish pure transmission of the seed color. It was further found that self-pollination of mustard can take place and that self-pollination continued several generations does not reduce the yield of seed or give rise to weak plants. Crossing a pure yellow-seeded form with a brown-seeded plant of one of the lines studied indicated that xenia in the yellow-seeded mother plant may show itself in the form of a browning of the seed coat. Such a cross also showed a different behavior in the F_1 and a different segregation in later generations than the cross of pure yellow-seeded with pure brown-seeded mustard.

Experiments were conducted with oats to determine whether individual Johannsen lines may be permanently distinguishable from each other by means of the hairs and awns of the outer or lower grains in the spikelets, the color of the glumes of these grains, or the number of grains per spikelet, even when selection in opposition to the line characters is practiced. After the constancy of the line character had become apparent, a comparison of a number of morphologically uniform lines was made to establish whether the relative heritability of characters finds expression each year or only in the average of several years. Finally, studies were made to determine whether seasonal conditions had a definite influence on the characters under observation. The work was begun with four plants grown from grains taken in 1906 from seed of Seehsart oats.

The observations made on a series of external characters indicated without exception that in a Johannsen line definitely directed selection, even if carried through a comparatively large number of generations, does not modify the line character. The different characters studied were the varying degree of development of the highly modifiable coloring of the seed coat, the interchange between two colors of the seed coat as exhibited in subvarieties of mustard, and the variable development of the very strongly modifiable external characters (hairiness, the presence of awns in the outer grains of oats, and the number of grains produced per spikelet in oats. A number of cases of spontaneous qualitative variation which appeared after a varying number of generations had been self-pollinated are reported.

From the results of the breeding investigations it was concluded that certain external characters, such as those mentioned above as having been the subject of these studies, can not be brought, even by means of continued self-pollination and selection, to a more definite, permanent, and stronger expression. It is stated that the Johannsen lines in question belong to form groups which either show the several characters with different degrees of modification or, as in the case of the mustard lines, represent subvarieties. The statement is made that seed production in the field is more difficult when the particular form group has such highly variable external characters as some of the Johannsen lines of legumes and oats here studied. It is believed that the value of continuing selection with self-pollinated plants was further brought out by the possibility of spontaneous qualitative variations as shown in these experiments, as well as by the fact that certain branches of a Johannsen line may exhibit a difference in growth for several years. Spontaneous quantitative variations were not observed in any of the lines under experiment.

[Work with field crops], A. Boss (*Minnesota Sta. Rpt. 1915*, pp. 85, 86).—The activities of the sections of farm crops and of plant breeding are briefly stated.

Experiments with different grades of seed oats are reported as showing that the heavier seed gave the larger increased return for the labor of preparation, and that for certain varieties of oats thick seeding seemed to be an advantage.

Minnesota No. 261, an early variety selected from the Kherson, outyielded the medium early varieties of oats in the season's trials. In seeding tests with wheat, 1.75 bu. of seed per acre yielded 2.2 bu. more than seeding 1.25 bu., the common rate of drilling.

The results of forage crop studies indicated that as good stands of alfalfa were secured where nurse crops were used as where the crop was sown alone. July seeding, when no nurse crop was used, resulted in the best stands and in the best yields the following year, as compared with seeding in August after potatoes or barley. Inoculation increased the yield and gave a product richer in protein. The soil transfer method of inoculating gave somewhat better results than the use of commercial cultures, and the application of lime gave a definite increase in yield.

Sudan grass gave an average yield of 3.36 tons per acre, and where cut for seed, 700 lbs. of seed were secured. The best yield of hay was obtained by drilling 24 lbs. of seed per acre on June 15 and the best yield of seed by sowing 40 lbs. of seed with a grain drill on May 15.

Experiments with sweet clover pointed out the value of inoculation and the use of lime. Inoculation by transfer of sweet clover soil and the addition of lime gave a much larger yield than inoculation with sweet clover soil without lime or inoculation with alfalfa soil with lime. Where no treatment was given the yield was comparatively small.

Data accumulated in the continued selection of wheat for 14 years, with the object of shortening the stem between the head and the upper leaf for the purpose of decreasing the amount of surface exposed to rust, are reported as showing no progressive effect. The results of corn-breeding work during the year indicated little correlation between earliness of germination and time of maturity and no appreciable correlation between the rapidity of germination of seed of the same ears tested under different temperatures.

[Work with field crops], W. G. TAGGART, A. P. KERR, J. B. GARRETT, and F. C. QUEREAU (*Louisiana Stas. Rpt. 1915*, pp. 8-11, 15-17, 27, 28, 29, 30-32).—At the Sugar Experiment Station a complete fertilizer containing 90 lbs. of sulphate of potash per acre gave an increase over check plots fertilized with equal amounts of nitrogen and phosphoric acid, but without potash, of 3.6, 3.55, and 1.73 tons of sugar cane per acre. A comparative test of nitrogenous fertilizers showed that calcium cyanamid ranked close to nitrate of soda and sulphate of ammonia. Calcium nitrate did not prove so satisfactory on sugar cane as on corn. A mixture of 500 lbs. of cotton-seed meal and 250 lbs. of acid phosphate per acre gave an increase of 2.7 tons of sugar cane, and a mixture of 500 lbs. of cotton-seed meal and 500 lbs. of acid phosphate an increase of 8.9 tons, as compared with no fertilizer treatment. A similar experiment in which tankage was used as the source of nitrogen gave an increase of 1.1 tons in the first place and 8.4 tons in the second. These results represent the average of four years. The use of 1.5 in. of water applied in irrigating sugar cane on April 28, May 17, and May 26, produced an increase of 7.6 tons of cane over an unirrigated check plat.

The propagation of new varieties of sugar cane showed that seedling L 511 made a good growth and contained 14.9 per cent of sucrose in the juice, or from 4.5 to 5 per cent more than the juice of cane grown generally. The next seedling in order of value was L 231, and, in addition to this, there were six others giving promising results.

The development of a white flint corn similar to Yellow Creole, which was found in variety tests to be the most suitable to local conditions as a general field crop, is reported. Corn fertilized before planting yielded 49.85 bu., while

corn receiving the fertilizer application after planting yielded 51.45 bu. per acre. Velvet beans proved a little better than cowpeas and soy beans for green manures. The results of experiments with corn indicated that bagasse had no value as a fertilizer. Other fertilizer experiments with corn indicated clearly the responsive power of stiff soils to pea-vine fallow and the use of nitrogenous fertilizers. Alfalfa produced 8.6 tons of hay per acre. Kudzu yielded a large quantity of forage and gave evidence of its value for smothering out Johnson grass.

A brief summary of the work at the State Station points out that a mixture of corn and soy beans, among the different crops tested, gave the best silage. The results of culture tests indicated that there was practically no difference in yield from the application of all of the fertilizer before planting, all during cultivation, or half before planting and half during the cultivation. Removing suckers from corn slightly increased the yield but not sufficiently to compensate for the labor. A plat where cowpeas were planted with corn when laid by, followed by a crop of clover in the fall with a light application of stable manure every three years, produced about five times as much corn as a plat receiving the same cultivation without the manurial treatment. Green manuring with red clover seemed to give as large a yield of corn as green manuring and an application of phosphate and lime in addition. Of 20 varieties of corn tested, Calhoun Red Cob and Yellow Creole were among those giving the best results in yield and in keeping qualities.

Among the forage crops tested, Sudan grass proved promising. It was found best to sow this grass at the rate of 20 lbs. per acre about April 1 in the locality of the station. The growth of ramie is reported as very successful.

At the North Louisiana Station rock phosphate and velvet beans have proved slightly inferior to acid phosphate in the production of both corn and cotton. The use of 315 lbs. of equal parts of cotton-seed meal and acid phosphate as a fertilizer for Sudan grass trebled the yield as compared with the yield of plats receiving no fertilizer. In a test of 18 varieties of cowpeas, Whippoorwill, Groot, New Era, and Brabham, proved superior. The yields of 14 varieties of soy beans varied from a little over 3 to 20.5 bu. per acre, Hollybrook being the leading variety. Of 13 crops, the rank-growing sorghums, particularly Honey sorghum, produced the heaviest tonnage of silage and sowing material. The maximum yield secured was a little over 34 tons per acre on good, red, sandy loam soil fertilized with 200 lbs. of cotton-seed meal and acid phosphate per acre.

The highest yielding varieties of sweet potatoes under test were Doody Yam, Jersey Yellow, and Southern Queen. Twelve fertilizer experiments with sweet potatoes did not give results with a degree of uniformity to warrant conclusions. It is reported that in a sweet potato storage house sweet potatoes were kept in good condition with very small loss.

In 22 tests in thinning cotton, uniformly better results have been secured by following the usual practices.

Plots under a 2, 3, and 4 year rotation experiment at the Rice Station gave an average yield of 17.6 barrels of rice per acre, while the check plots conveniently in rice yielded 2.18 barrels per acre of pure red rice. Corn and oats were included in the rotation, and it is believed that rotations including upland crops should be of long duration and that under such a system several profitable crops of rice may be grown in succession.

The use of 200 lbs. acid phosphate per acre has produced the most profitable rice crops for five years in succession. Potash salts have not shown any appreciable increase in yield. Readily available forms of nitrogen were inferior

to organic forms for Honduras rice, but for late maturing varieties the differences were not great.

The Mungo bean appeared to make a heavier growth of vine than any other leguminous crop grown at the station. Garlic also seemed to do well on rice soils.

Suggestions for the use of fertilizers for tobacco and onions for 1913, H. D. HASKINS (*Massachusetts Sta. Circ. 60 (1916)*, pp. 4).—A brief popular discussion of the use of fertilizers for tobacco and onions, suggesting for each crop two fertilizer formulas and noting the value of the use of lime.

Corn in Montana, A. ATKINSON and M. L. WILSON (*Montana Sta. Bul. 107 (1915)*, pp. 11-128, figs. 34).—This bulletin discusses the economic importance of corn for Montana, reviews its history from its earliest culture by the Indians down to the present day, presents notes on the classification and varietal history of corn, describes a list of varieties adapted to certain regions of the State, and points out the influence of the prevailing climatic conditions on the production of the crop.

The results of experiments conducted in 1913 and 1914 at Wibaux, where the conditions of eastern Montana are fairly well represented, are reported in tables and discussed. Seven varieties of flint were found to have an average total leaf area per plant of 1,868.6 sq. in., 2 varieties of late flint of 2,124.4, 3 varieties of semident of 1,211.6 varieties of early dent of 1,119.4, and 2 varieties of late dent 2,101.8 and 4,678.2 sq. in., respectively. The average length of stalk was 47.6 in. in the early flint, 70.1 in. in the semident, and 62.6 in. in the early dent varieties. No great variation was observed in the lengths of the first two or three internodes of any of the groups. Of the stalks studied the early flint varieties had from 6 to 9 internodes, the semident 8 to 11, and the early dent 9 to 10. In the early flint group the internodes were also much shorter than in the other groups. The early flint, early dent, and semident groups had about the same shelling percentage, which varied from 70 to 80 per cent. The proportions of coarse and fine stalk, shelled corn, and cob were determined and are reported in a table. The results of variety tests at Wibaux and at the Huntley substation are also tabulated.

Corn: Varieties, ear-row, and limiting factor tests, W. L. HUTCHINSON (*South Carolina Sta. Bul. 186 (1916)*, pp. 14).—The results of variety and ear-to-row tests conducted at the station and the Pee Dee substation are tabulated. Data secured in fertilizer and culture tests made at the Pee Dee substation in 1914 and 1915 are also reported.

In 1913 the yields of 27 varieties at the station ranged from 28.3 to 49 bu. per acre, Surecropper being the leading variety, and in 1915 the yields of 4 varieties ranged from 24.5 to 37.5 bu., Coker Williamson being the leading sort. At the Pee Dee substation No. 181, among 20 varieties, stood first in yield in 1914 with 52.7 bu. per acre, and Chappell Garlic, among 17 varieties in 1915 with 52.1 bu.

Ear-to-row tests at the station in 1913 indicated differences in yielding capacity ranging from 27.7 to 77.7 bu. per acre, and in 1915 from 5.2 to 59.7 bu. At the Pee Dee substation in a similar test in 1914, the lowest producing ear yielded at the rate of 24.3 and the highest at the rate of 50.3 bu. per acre.

The results secured in the fertilizer tests led to the conclusion that nitrogen is the element most needed under the conditions of the test. The culture test indicated that the method of planting corn in the water furrow between beds and applying all fertilizers to the growing crop may have some merit. A plot treated in this way yielded at the rate of 48 bu. per acre, or more than any one of four other methods of culture under experiment.

Field corn in western Washington. E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 4 (1916), No. 2, pp. 7-9).—The possibility of growing corn in western Washington is discussed and some of the experimental work with corn by the substation is briefly noted. Conclusions based on general observations, as well as the results of experiments, are presented, and Minnesota No. 13, Rutherford Dent, Pearsall Dent, Northwestern Smoky Dent, Windus White Dent, and King Phillip are described with reference to their adaptability to the conditions and needs of the region.

Wilt-resistant varieties of cotton. E. F. CAUTHEN (*Alabama Col. Sta. Bul.* 189 (1916), pp. 67-88, pl. 1, fig. 1).—Tests made of wilt-resistant varieties of cotton in cooperation with farmers having suitable lands are reported, and notes are given on the nature of cotton wilt and on methods of controlling the disease. The wilt-resistant varieties, Dillon, Modella, Cook, Wood, Covington-Toole, Wilt-Resistant, Tri-Cook, Cook 307-6, Dixie, and Dix-Afifi, used in the experiment, are briefly described.

A comparison of the different varieties tested, based on the value of lint and seed per acre as indicated by the average results of 15 experiments, showed the following total values per acre: Cook, nonresistant strain, \$26.78; Modella, \$28.66; Wood, \$33.09; Dixie, \$33.22; Cook 307-6, \$34.17; Covington-Toole, \$34.42; and Tri-Cook, \$40.53 per acre. The range of gains from resistant varieties extended from 8.1 per cent with Wood to 51.3 per cent with Tri-Cook. The average percentage of loss of plants from wilt in these tests was as follows: Cook, nonresistant strain, 40.3; Wood, 15.1; Modella, 14.7; Covington-Toole, 10.5; Cook 307-6, 9.3; Dixie, 8.5; Tri-Cook, 7.3; and Dillon, 5.4 per cent. Dix-Afifi lost no plants in the two experiments in which it was planted.

It is pointed out that these wilt-resistant varieties differ slightly in their relative earliness and that they are somewhat later in the time of opening than such standard varieties as Cleveland, Cook, and Triumph. Among the resistant varieties tested those ranking highest in total money value of seed and lint per acre were the earliest and turned out about 40 per cent of lint.

Methods and results of breeding flax. L. ALTHAUZEN (ALTHAUSEN) (*Zhur. Agrof. Agron. (Russ. Jour. Expt. Landw.)*, 15 (1914), No. 1, pp. 12-59, figs. 12).—This article describes the methods of flax breeding employed by the agricultural chemical laboratory at St. Petersburg, together with the principles on which they are based. The work is planned to bring practical results in a short time and at a low expenditure of cost and effort. Some of the more general results are briefly noted.

It is pointed out that from a single selection made in 1909 there were obtained from the same variety seven different forms, among them one presenting with other characters an average length of stem of 80.6 cm. (31.4 in.) up to the joint of branching and another with only 47.9 cm. as the corresponding figure. Selections made in 1911 of 24 commonly grown varieties of flax and propagated for two generations showed that these varieties represented a mixture of forms. The isolation of forms not only exhibited marked differences in height of plant, length of stem, and similar readily recognizable characters, but also variations in the color and size of the blossoms and other minor or less apparent qualities. One of the forms isolated had an average blossom diameter of 1.95 cm. as compared with 1.70 cm. and 1.67 cm. for a common variety grown as a check and a small blossomed form, respectively.

Natal grass, a southern perennial hay crop. S. M. TRACY (*U. S. Dept. Agr. Farmers' Bul.* 726 (1916), pp. 16, figs. 4).—Historical, descriptive, and cultural notes are given on Natal grass, and its value and uses are set forth. An analysis of Natal grass hay is included.

Field peas, N. S. ROBB (*Idaho Sta. Circ. 2 (1916)*, pp. 8, fig. 1).—A brief popular account discussing the adaptation of field peas to climate and soil, the principal varieties, and the culture and uses of the crop.

Effect of climatic factors on the hydrocyanic-acid content of sorghum. J. J. WILLAMAN and R. M. WEST (*U. S. Dept. Agr., Jour. Agr. Research*, 8 (1916), No. 7, pp. 261-272, figs. 4).—The experiments here described were in continuation of work previously noted (E. S. R., 33, p. 234), and were conducted by the Minnesota Experiment Station in 1915 to study the effect of climatic conditions on the amount of glucosid in the sorghum plant. For this purpose two varieties of sorghum, Southern Cane and Early Amber, were grown on plats in Minnesota, Utah, Kansas, and South Dakota, under widely different climatic and cultural conditions. The results are presented graphically and in their discussion the factors which might have any bearing on the cause of the variations in cyanid content or throw any light on the function of the glucosid dhurrin in sorghum are specially considered.

The amount of dhurrin in each plant was found to vary considerably. A unhealthy condition of plants, from whatever cause, was usually associated with a higher hydrocyanic-acid content than was found in healthy plants. It is thought possible that under such conditions the plant produces more glucosid for the sake of the stimulating hormones in it. The apparent effect of humidity and temperature on the amount of cyanid in sorghum is considered as probably due to the indirect effect on the rate of growth. Adequate water supply was usually accompanied by a low and inadequate by a high cyanid acid content. It is believed that this is probably due to the need of glucosid stimulation when the water supply becomes low. The character of the growth of the plant is reported as affecting the distribution of dhurrin between leaves and stalks. There was found a proportionately smaller amount in the thick heavy stalks than in the slender ones. It is stated that there is no consistent daily variation in the amount of dhurrin, and that this argues against the functioning of this glucosid as a food storage. The Southern Cane in every plat but one had a higher content of hydrocyanic acid than the Early Amber, and it is concluded that varietal difference is probably of more weight in determining the amount of hydrocyanic acid in sorghum than are the conditions of growth.

Nitrogen content of the wheat of the Transvolga region, N. TULAKOV (TULAJKOV) (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 15 (1915), No. 1, pp. 1-11).—Results of analyses made during the four years beginning with 1910 by the experiment station at Besentschuk showed that the nitrogen content of hard and soft wheats from this region was about the same, and that the average nitrogen content of the hard and soft wheats grown in 1911 in the various districts of the government of Ssamara was the same. The grain of different botanical subvarieties of spring wheat grown under the same conditions of soil and climate showed no differences in the content of total nitrogen. It is stated that variations in the nitrogen content of wheat of the harvest of a particular year and produced under identical climatic conditions must be attributed to differences in the chemical composition and ionic pressure of the soil solution, as botanical differences have no influence in this connection.

Further observations on combating weeds with kainit, T. REMY and J. VASTERS (*Landw. Jahrb.*, 48 (1915), No. 1, pp. 137-169, pls. 4).—The effect of applying kainit, calcium cyanamide, and iron sulphate in controlling ragweed, cornflower, wild poppy, wild radish, coltsfoot, wild mustard, Canada thistle, sour thistle, and colchicum was observed in field and pot experiments.

The results confirmed the conclusions drawn from previous work, and brought out again the value of kainit in the control of weeds, especially wild mustard.

wild radish, and cornflower. Kainit was most effective when brought in contact with the plants when these were in the initial stages of development. It was not found desirable to delay the application beyond the appearance of the first flower buds of the weeds studied. The best results with reference to injuring the weeds and benefiting the crop were secured when application was made at the time the grain plants began to stool. It is pointed out that fertilizing with kainit before seeding is frequently of greater benefit to the weeds than to the crop, especially so in the case of rye fields infested with cornflower.

The statement is made that if the use of kainit is to be satisfactorily effective an adequate quantity must be applied when the plants are wet from dew or rain and the kainit solution must remain active on the parts of the plants above ground for a sufficient length of time. For weed control the use of about 1,300 lbs. of kainit per acre is recommended.

Iron sulphate and calcium cyanamid were generally less effective than kainit. The wild poppy proved most sensitive to calcium cyanamid, and in these tests a mixture of 668 lbs. of kainit and 67 lbs. of calcium cyanamid per acre proved more injurious to cornflower than double the quantity of each substance when applied alone.

HORTICULTURE.

The present status of vegetable breeding, E. VON TSCHERMAK (*Ztschr. Pfanzenzücht.*, 4 (1916), No. 1, pp. 65-104).—The more important results of breeding investigations with different kinds of vegetables are reviewed. A bibliography of cited literature is included.

Fertilizer experiments with various vegetables on low moor land, ALVES (*Mitt. Ver. Förd. Moorkultur Deut. Reiche*, 33 (1915), No. 13, pp. 287-292).—Fertilizer experiments with different kinds of vegetables conducted in 1914 under the direction of the German Society for the Promotion of Horticulture and the Association of German Vegetable Growers are reported.

Vegetable tests on sandy soil at the Umatilla Experiment Farm, R. W. ALLEN (*Oregon Sta. Bul.* 136 (1916), pp. 3-38, figs. 9).—This bulletin presents the results of variety and cultural tests of various vegetables conducted during the past six years. The subject matter is presented under two general crop divisions, namely, important vegetable crops and minor truck crops, the latter crops being poorly adapted to the district or of only secondary commercial importance. Included in the crops which are promising on account of their production and marketing possibilities are asparagus, eggplant, muskmelons, onions, parsnips, pens, potatoes, sweet corn, and watermelons.

The vegetable garden in New Hampshire, J. B. SCHERRER (*N. H. Col. Ext. Bul.* 8 (1916), pp. 42, figs. 20).—The principles of vegetable gardening are here considered with special reference to their adaptation to the home garden and the small commercial garden.

Vegetable growing (*Mass. [Bd.] Agr. Bul.* 5, 2. ed., rev. (1916), pp. 185, pls. 5, figs. 14).—Some of the articles in the previous edition of this bulletin (*I. S. R.*, 26, p. 539) have been superseded by new ones and a number of other new articles relating to vegetable growing have been added. The subject matter as a whole has been thoroughly revised and brought up to date.

Specific chemical and structural variations caused by grafting the tomato on the cabbage, L. DANIEL (*Compt. Rend. Acad. Sci. [Paris]*, 162 (1916), No. 11, p. 397-399).—The variations here described consist of the development of granular cells containing oxalate of lime in the cabbage and the occurrence in the cabbage throughout the region of the union of a well-developed internal medullary lobe similar to that of the tomato.

The fruiting relations of various garden forms of *Brassica oleracea*, T. ROEMER (*Ztschr. Pflanzenzücht.*, 4 (1916), No. 1, pp. 125-141).—The results are given of self and cross pollination experiments conducted in 1914 and 1915 with kale, kohlrabi, Brussels sprouts, and cabbage.

Things to be emphasized in present day horticulture, U. P. HEDRICK (N. Y. *Dept. Agr. Bul.* 74 (1915), pp. 2489-2501).—A review of some results of experiment station work. Among the subjects considered are fertilizer experiments with apples, improving old varieties of fruits, cultural tests of European grapes, fruits resistant to insects and fungi, fruit stocks, methods of improving size, quality, and color in apples, and profits from an apple orchard.

Fruit growing in Spain, G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ.*, 7 (1915), Nos. 80, pp. 733-742; 81, pp. 813-822; 82-83, pp. 921-939; 84, pp. 1013-1021).—An economic study of the fruit industry in Spain with reference to its history, present status, and factors influencing its future development.

The sorting, sizing, packing, and storing of fruit, E. L. MARKELL (*Trans. Peninsula Hort. Soc. [Dcl.],* 29 (1916), pp. 41-47).—A popular paper on the handling and storing of apples in which some of the results are given of storage investigations conducted by the U. S. Department of Agriculture.

The act relating to the standardization of fruit packing, G. P. WELDOS (*Mo. Bul. Com. Hort. Cal.*, 5 (1916), No. 4, pp. 125-128).—The text is given of the California fruit-packing act which went into effect August 9, 1915.

Recent developments in sulphur sprays, J. P. STEWART (*Trans. Ill. Hort. Soc., n. ser.*, 49 (1915), pp. 186-193).—In this paper the author gives special attention to the character of the materials used in sulphur preparations intended for spraying purposes.

Results of spraying experiments for 1915, Neoga station, Cumberland County, O. S. WATKINS (*Trans. Ill. Hort. Soc., n. ser.*, 49 (1915), pp. 202-221).—In continuation of previous experiments conducted at Neoga (E. S. R. 33 p. 39), experiments were conducted in two orchards in 1915. The chief lines of investigation included tests of several proprietary sprays in comparison with Bordeaux mixture and lime-sulphur-arsenate of lead, a comparative test of several brands of arsenate of lead, tests of the effect of special sprays against codling moth infestation as applied at various times throughout the season, a comparison of certain standard nozzles, and a test of a dusting machine and dust sprays. The data secured are presented in tabular form and discussed.

In view of seasonal conditions the results as a whole were not favorable for drawing definite conclusions. The following conclusions, however, appear to hold good in any season. Blackleaf 40 should not be used with arsenate of lead without Bordeaux mixture or lime-sulphur, as it dwarfs the fruit. Neoga soluble sulphur in combination with arsenate of lead should not be used on apple trees, as the trees thus far sprayed with this combination have been seriously injured.

Intercropping the young orchard: From an economic standpoint, M. C. BURRITT (N. Y. *Dept. Agr. Bul.* 74 (1915), pp. 2502-2511, fig. 1).—A discussion of the cost of production in orcharding, with special reference to the use of intercrops to reduce this cost. Data are given showing the economic results of intercropping as practiced in the author's orchards.

Report of the horticulturist, A. G. TURNER (*Rpt. Agr. New Brunswick* 1915, pp. 100-114, pls. 2).—A progress report on the work of the horticulture division for the year 1915, including data on the cost of operations and return secured in some demonstration apple orchards.

In view of the prevalence of apple scab in one orchard of 45-year-old *Fameuse* trees it was decided to top-work the trees to some other variety. Records were

kept and are here given showing the cost of top-working, as well as the amount of fruit harvested from top-worked trees as compared with similar ungrafted Pameuse trees. The total cost for one season in top-working these trees to another variety was \$1.215 per tree.

An experiment was undertaken to determine whether apple scab could be controlled to any extent by removing and destroying the affected twigs before the spores had a chance to germinate. The trees received the usual spraying. The results, although not conclusive, indicate that the removal of the twigs does aid in checking the scab. In the three previous years the trees had been sprayed thoroughly without producing any marked improvement, whereas in the present season they produced nearly all clean fruit in one of the worst scab seasons for years. A similar experiment in removing and burning the fallen leaves early in the spring indicates that this practice is also successful in checking the scab.

The cherries of Japan, E. H. WILSON (*Publ. Arnold Arboretum, No. 7 (1916), pp. XIV+68, pls. 8*).—This comprises an enumeration and description of the Japanese species of cherries. The work is based upon investigations conducted by the author in Japan, including studies of collected material and material preserved in the herbarium of the Imperial Botanic Garden, Tokyo.

Peach spraying experiments, 1915, Walter White orchard, near Centralia, Ill., O. S. WATKINS (*Trans. Ill. Hort. Soc., n. ser., 49 (1915), pp. 198-202*).—Tabular data are given showing the value of different sprays used on a two-acre peach orchard at Centralia in 1915. The test included a number of brands of arsenate of lead, soluble sulphur, copper ferrocyanid, commercial lime-sulphur, and dust spray.

The grape industry in California (*Cal. State Bd. Vit. Comrs. Bul. 6 (1916), pp. 18*).—A statistical review of the grape, wine, and raisin industry in California for the year 1915, including some comparative data for 1914. A table is also given showing carload shipments of deciduous fruits.

Report of the National Congress of Viticulture, held at Pamplona, Spain, July, 1912 (*Mem. Gen. Ses. Cong. Nac. Vit., 1912, pp. XXXIX+559, pls. 5, figs. 19*).—This comprises a general account of the sessions of the National Congress of Viticulture at Pamplona, Spain, in July, 1912, together with the papers, some 50 in number, presented at the congress.

The more important themes discussed include methods of combating various insect pests and diseases; protection of vineyards from late frosts and other climatic disturbances; marketing problems; the culture of grapes in connection with other crops; the reconstitution of phylloxera-infested vineyards, including observations on various American stocks; direct-bearing grapes and hybrid direct-bearing grapes; adaptation of varieties to different types of soil; fertilizers; methods of pruning; methods of preparing and conserving wines; and methods of preventing the falsification of wines. Although the majority of the papers relate to Spanish conditions, a number of papers by French viticulturists and viticultural investigators were presented, together with papers on the viticultural industries in Hungary, Argentina, Chile, and Uruguay.

Grape growing in the Nasik District, H. V. GOLE (*Dept. Agr. Bombay Bul. 7 (1915), pp. 25, pls. 5*).—A practical treatise on grape growing in the Nasik District, India, the subject matter being based largely on the author's experience in growing Vinifera grapes.

Renewing old citrus trees, A. D. SHAMEL (*Cal. Citrogr., 1 (1916), No. 7, pp. 2, 3, fig. 1*).—The author cites the beneficial results secured as to yield and quality of fruit when old apple trees are severely cut back. Attention is then called to the practice employed in Bahia navel orange groves in which the trees after 20 to 25 years begin to lose their power of producing profitable

crops. The old tops are removed at this period and new ones grown. It is claimed by the growers that the renewed trees produce larger and better fruits than the original bore at any time. A study of the performance records of the renewed trees appeared to confirm the statements of the growers. Special attention is called to the desirability of studying the effect of renewal of old navel trees in California in conjunction with the maintenance of individual tree records with reference to the time of pruning, the cultural treatments, amount of fruit produced, etc.

Ribbed Valencia sport, H. J. WEBER (*Cal. Citrogr.*, 1 (1916), No. 7, p. 3, fig. 1).—A description with illustrations is given of a variation of the Valencia orange in which the fruit is ribbed.

Preliminary results on budding and grafting experiments with cacao, H. VAN GENT (*Meded. Cultuurtuin [Buitenzorg]*, No. 5 (1915), pp. 9, pls. 5).—Budding and grafting experiments conducted in the Buitenzorg gardens are reported.

Method in manurial experiments with trees (*Agr. News [Barbados]*, 15 (1916), No. 366, pp. 145-147).—A brief description of methods employed in manurial experiments with coconuts and cacao trees in the West Indies and British Guiana.

Manurial experiments on coconuts, 1914-15, J. DE VERTEUIL (*Bul. Dep. Agr. Trinidad and Tobago*, 15 (1916), No. 2, pp. 56-66, pls. 3).—This report deals with the fourth year's results of manurial experiments with coconuts being conducted under the direction of the Trinidad Board of Agriculture (E. S. R., 32, p. 236).

Coconut experiments, C. H. KNOWLES (*Dept. Agr. Fiji Bul.* 8 (1915), pp. 6, pls. 2).—An outline is given of selection experiments with coconuts being conducted on Viti Levu, Fiji, including notes on the methods used in selecting seed nuts and brief descriptions of the varieties selected.

Germinating coconuts, O. F. COOK and C. B. DOYLE (*Jour. Heredity*, 7 (1916), No. 4, pp. 148-157, figs. 6).—An illustrated study of the germinating coconut.

The grafting of coffee, W. M. VAN HELDEN (*Meded. Cultuurtuin [Buitenzorg]*, No. 4 (1915), pp. 11, pls. 3, figs. 3).—Methods of grafting coffee are described and a list is given of the grafts of various varieties of imported coffees in the Buitenzorg gardens in 1914-15.

Growing melons on trees, J. E. HIGGINS (*Jour. Heredity*, 7 (1916), No. 5, pp. 208-220, figs. 7).—An account of the papaya with special reference to irregularities in sex and methods of breeding desirable types. The subject matter is based largely on the work of the author and V. S. Holt at the Hawaii Experiment Station (E. S. R., 30, p. 841).

Top-working pecan trees, E. J. KYLE (*Agr. and Mech. Col. Tex. Ext. Bul.* B-21 (1916), pp. 7, figs. 6).—Directions are given for top-working pecan trees by using different methods of budding.

Commercial production of thymol from horsemint (*Monarda punctata*), S. C. HOOD (*U. S. Dept. Agr. Bul.* 372 (1916), pp. 12).—As a result of selection experiments with horsemint (*M. punctata*), here briefly described, the author has been successful in securing an improved form more luxuriant in growth and with a higher thymol content than in the wild form. It is believed that the selection work has been carried far enough to warrant the use of this improved form for the commercial production of thymol in the United States. Cultural methods for horsemint are here discussed, together with methods of harvesting, distillation, and extraction of the thymol.

During the past five years areas up to one acre in extent have been grown on various soils. The results show that an average production of 20 lbs. of

oil, or about 12.86 lbs. of pure thymol, per acre from first-year plantings may be regarded as a fair crop. The estimated returns based on the work done thus far show that a profit of about \$16 per acre may be expected as an average for a 5-year period. Hence, it is concluded that the production of thymol might be profitable when grown in connection with other oil-yielding plants for which a distilling apparatus is required.

Beautiful gardens in America. LOUISE SHELTON (New York: Charles Scribner's Sons, 1915, pp. XVI+187, pls. 135).—An illustrated work in which are shown types of American gardens, covering all sections of the country. The aim has been to show those gardens which represent the development of the owner's ideal rather than imitations of foreign types of formal gardens.

Every woman's flower garden. MARY HAMPTON (New York: Duffield & Co., 1915, pp. IX+353, pls. 5, figs. 83).—A popular treatise on ornamental gardening with suggestions relative to garden design and plants for different types of gardens.

Notes on new plants and plants not well known. W. HUNT (Ann. Rpt. Hort. Soc. Ont., 10 (1915), pp. 57-64, figs. 2).—This comprises a brief review of some of the newer or less-known plants that have been tested in the flower borders and grounds of the Ontario Agricultural College during the past five years. Special attention is given to those that have proved to be most adapted for the amateur's garden.

Popular hardy perennials. T. W. SANDERS (London: W. H. & L. Collingridge, 1916), pp. [6]+440, pls. 17, figs. 2/2).—This work deals with popular hardy perennials relative to their cultivation in beds, borders, the wild and woodland garden, and by the water side. The propagation of hardy perennials is also discussed, and descriptions given of the most attractive, useful, and easily grown genera, species, and varieties.

Breeding Nephrolepis ferns. S. BOSHNAKIAN (Jour. Heredity, 7 (1916), No. 5, pp. 225-236, figs. 8).—An account of the Nephrolepis ferns with reference to the development of different types of sports and methods of propagating and disseminating them.

The history, development, and propagation of the lilac. J. DUNBAR (Ann. Rpt. Hort. Soc. Ont., 10 (1915), pp. 75-81).—An address before the Horticultural Societies of Ontario, 1915, in which the author discusses the history of the lilac and the development of the present improved types. A selection is given of the most distinct varieties of lilacs.

Preliminary experiments in poppy breeding. R. RANNINGER (Ztschr. Pflanzenzücht., 4 (1916), No. 1, pp. 45-64).—The results are given of some breeding and selection experiments with poppies, conducted in 1914 and 1915.

The American rose annual. edited by J. H. McFARLAND (Harrisburg, Pa.: American Rose Society, 1916, pp. 153, pls. 10, figs. 7).—This is the first of a series of annuals to be published by the American Rose Society. It discusses the aims and purposes of the society and contains articles dealing with varieties, the adaptation of the rose to extended uses, rose breeding, the literature of the rose, the enemies of the rose, rose gardens in different parts of the United States, the value of local rose organizations, cut flower rose growing, and the work of the American Rose Society. A partial list is given of American hybridized roses, with parentage and date of introduction so far as ascertainable.

The best hardy conifers. E. H. WILSON (Gard. Mag. [N. Y.], 22 (1915), No. 3, pp. 147-150, figs. 18).—Descriptive notes are given on a large number of hardy conifers adapted for ornamental planting.

FORESTRY.

Forestry handbook.—I, Forest principles and practice, edited by R. DALBYMPLE HAY (*Sydney: Govt.*, 1915, pp. 87, pls. 21, figs. 45).—The present part of this handbook consists of a summary of useful information bearing upon the principles and practice of forestry in New South Wales. The subject matter is presented under the following general headings: General principles of forestry, climatic and protective influence of forests, afforestation, reafforestation, identification of timbers, measurement and mensuration (weight of timber, forest assessment and survey, forest working systems, and timber physics), a treatise on timber tests, and a summary of results.

A practical treatise on silviculture, A. JOLYET (*Traité Pratique de Sylviculture. Paris: J. B. Bailliére & Sons*, 1916, 2. ed., rev., pp. 724, figs. 130).—This work comprises a completely revised edition of *Traité Pratique de Sylviculture: Les Forêts*, written by L. Boppe and the author, previously noted (E. S. R., 12, p. 756). The work has also been considerably enlarged.

Silviculture, E. MABSDEN (*Ann. Rpt. Bd. Sci. Advice India*, 1914-15, pp. 129-123).—A brief statement of progress made in the more important silvicultural investigations during the year.

The selection strip-felling and its system, C. WAGNER (*Der Blenderschlag und sein System. Tübingen: H. Loupp'schen Buchhandlung*, 1915, 2. enl. ed., pp. XII+382, pls. 2, figs. 75).—The present edition of this work (E. S. R., 27, p. 444) has been revised and slightly enlarged.

The green book (*Bingham, Me.: Kennebec Valley Protec. Assoc.* [1916], pp. 32, figs. 10).—A manual for the use of lumbermen, woodsmen, and sportsmen containing the laws of the State of Maine relating to protection of the forests from fire and miscellaneous information of value in the woods.

Railroad fire prevention, W. T. COX (*Minn. Forest Serv. Bul.* 2 (1914), pp. 29, figs. 18).—This report takes up the different sections of the Minnesota forest laws relating to railroads and reviews the progress made in fire prevention under each section of the laws.

The torrents of Savoie, P. MORGIN (*Les Torrents de la Savoie. Grenoble: Soc. Hist. Nat. Savoie*, 1914, pp. XI+1251, pls. 69).—In part 1 of this work the author discusses in detail the origin of the torrents in Savoie, consideration being given to the topography of the country, geology of the soil, climate, deforestation, and torrential legislation. Part 2 consists of monographs on the principal torrents of Savoie.

The importance of private forestry in Japan, O. SHISHIMO (*Jour. Col. Agr. Tohoku Imp. Univ.*, 7 (1916), No. 1, pp. 99).—This paper gives an account of the past and present development of private forestry in Japan, discusses the economic importance both to the individual and to the State of the development of private forests, and suggests methods leading to the better development and utilization of these forests.

Extracts from the bulletin of the Forest Experiment Station, Meguro, Tokyo (Tokyo, Japan: Bur. of Forestry, Dept. Agr. and Com., 1915, pp. II+231, pls. 34, figs. 4).—The extracts here listed are from the bulletin of the Forest Experiment Station, Meguro, Tokyo, and are based on investigations made during the period from 1905 to 1914:

Investigation of Tree Seeds in Relation to the Producing Districts of the Mother Trees and Their Descent, by H. Shirasawa (pp. 1-14); Experiments on the Preservation of Principal Forest Tree Seeds, by H. Shirasawa and M. Koyama (pp. 15-27); Composition of Fallen Leaves of Forest Trees and Their Quantities (pp. 28-33), and The Proper Season for Application of Fertilizers

to Sugi (*Cryptomeria japonica*) and Hinoki (*Chamaecyparis obtusa*) Seedlings and the Efficacy of Fertilizers (pp. 36-41), by S. Moriya; Investigation of the Transverse Strength in Wood (pp. 42-54), and Determination of the Calorific Power of Wood (pp. 55-58), by K. Moroto; Experiment of the Electric Resistance in Wood, by J. Hiruma (pp. 59-63); Charcoal Burning in Japan (pp. 66-76), and Condensation of Wood Vinegar in Charcoal Burning in Japan (pp. 77-80); by S. Mimura; Tapping of Lac, by M. Moriya and H. Shirasawa (pp. 95-108); Notes on "Shiitake" (*Cortinellus shiitake*) Culture (pp. 109-114), Researches on the Culture of "Matsudake" (*C. edodes*) (pp. 115-122), and Researches on the "White Judas' Ear" (*Tremella fuciformis*) (pp. 123-126), by S. Mimura; Notes on the Analytical Interpretation of Growth Curves for Single Tree and Stands and on Application for the Construction of Yield Table for Sugi (*C. japonica*) (pp. 151-202), and Investigation on Form Height Tables for the Principal Conifers and Some Broad-Leaved Trees in Japan and Bases on Which They May Be Constructed (pp. 203-221), by W. Terazaki.

An inventory of Florida's forests and the outlook for the future, R. M. HARPER (*Fla. Quart. Bul. Dept. Agr.*, 26 (1916), No. 2, pp. 5-24, figs. 12).—A survey of the forests of Florida with reference to the area and density of the forests, their distribution and character, frequency of fire in different types, composition, prevalence of species, rate of growth and composition, and the influence of fire and agriculture on the permanence of forests.

Biennial report of the forestry commission for the years 1913-14, W. R. BROWN, J. E. TOLLES, and B. F. GREEK (*Bienn. Rpt. Forestry Com. N. H.*, 1913-14, pp. 114, pls. 14).—A progress report of operations conducted by the forestry commission, principally along the lines of forest fire protection, reforesting waste and cut-over land, acquisition and management of state forest lands, and educational work among woodland owners.

Report of the director of forestry for the year 1915, R. H. CAMPBELL ET AL. (*Dept. Int. Canada, Rpt. Dir. Forestry*, 1915, pp. 102, figs. 23).—The report includes a review of the several lines of work carried on during the year, and detailed reports of the work of the tree planting division and on the forest reserves in the separate Provinces, together with the report of the Forest Products Laboratories of Canada.

Forest products of Canada, 1914.—Lumber, lath, and shingles, compiled by R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul.* 56 (1916), pp. 62, pl. 1).—A statistical report on the production of lumber, lath, and shingles in the various Provinces of Canada during 1914, including information relative to the quantities of each species of wood used.

Economic forest products, C. E. C. COX (*Ann. Rpt. Bd. Sci. Advice India*, 1914-15, pp. 124-132).—A progress report for the year 1914-15 relative to investigations dealing with forest products.

DISEASES OF PLANTS.

Wound parasitism and predisposition, F. HESKE (*Centbl. Gesam. Forstw.*, 40 (1914), No. 11-12, pp. 456-461).—This is a discussion of the relations of host, parasite, enzym, etc., concluding with the statement that wound parasitism requires a real predisposition of the host plant to attack, consisting in an alteration of the natural state of the host as a primary or contributory condition. The situation as regards the plant may also be such as to render attack comparatively easy but yet not inevitable. This predisposition consists not only in the susceptibility of the plant, but may relate to influences acting upon the infective bodies also.

Report of the department of vegetable pathology and entomology, P. CARDIN (Estac. Expl. Agron. [Cuba], Informe An., 3 (1909-1914), pp. 98-173, pls. 5).—This report, covering the period from July, 1909, to July, 1914, contains an account of insect pests and fungus parasites, the host plants being arranged in alphabetical order according to their native names in Spanish, with references to bulletins, circulars, etc., in cases in which they have been noted previously.

Smuts of grain and forage crops in Kansas, L. E. MELCHERS (Kansas Sta. Bul. 210 (1916), pp. 3-38, figs. 20).—After giving general statements regarding the amount of loss due to smuts, the author describes the important smut diseases in Kansas, grouping them under the headings of corn smut and head smut of the sorghums; kernel smut of the sorghums, stinking smut of wheat, smut of oats, covered smut of barley, and smut of millet; and the loose smuts of wheat and barley. These different cereal diseases are described at some length and suggestions given for their control.

In connection with the control of loose smut, the author urges the necessity for seed plots so isolated as to prevent infection.

Experiments on varietal resistance to the bean and cotton anthracnose diseases, C. W. EDGERTON and C. C. MORELAND (Louisiana Sta. Bul. 155 (1916), pp. 24, figs. 4).—A report is given of some experiments on the varietal resistance of beans and cotton to anthracnose diseases.

The experiments with beans were carried on in both the field and the greenhouse in 1914, in 1915 in the field, and in the winter of 1914-15 in the greenhouse, cultures of *Colletotrichum lindemuthianum* from different sections and from different varieties of beans being tested. As a result of their experiments the authors conclude that the bean anthracnose fungus is composed of different strains which affect different varieties of beans differently. Some varieties were susceptible to many different strains of the fungus, while others were resistant to some strains but susceptible to others. Some varieties of beans were found practically immune to some strains of the fungus. The reason for this behavior is attributed to the fact that the bean anthracnose fungus is not variable, and is unable to adjust itself to slight variations in the host plant, and as varieties of beans are said not to cross readily there are no intermediate forms, which would permit the specialization seen in the different strains.

The experiments with cotton anthracnose (*C. gossypii*) were conducted in the field, as it was impossible to grow a sufficient amount of cotton to maturity in the greenhouse. The flats secured were obtained by natural infections in which the varieties were grown between rows of badly infected plants, and by artificial infections in which the flowers were inoculated with pure cultures of the anthracnose fungus. In the case of the experiments with cotton, the anthracnose fungus was found more variable and was able to adjust itself to variations in the host plant more readily than the bean anthracnose fungus. Cotton varieties were not found to show any marked variability in regard to their resistance to anthracnose. All the varieties tested seemed very susceptible to the disease, and, although in some cases slight differences were noted, these are not considered of importance.

A rust of *Astragalus sinicus* and two fungus diseases of mulberry, H. NOMURA (Atti Ist. Bot. R. Univ. Pavia, 2. ser., 9 (1911), pp. 37, 38).—Descriptions are given of the supposedly new species of fungi, *Coryneum mori* and *Phoma niphonia* on *Morus alba*, and *Tuberculina nomuriana* on *A. sinicus*.

A new smut fungus on *Arrhenatherum elatius*, H. C. SCHELLENBERG (Ber. Deut. Bot. Gesell., 33 (1915), No. 7, pp. 316-328, pl. 1, fig. 1).—A supposedly

new smut fungus is described under the name *Ustilago arrhenatheri*, in connection with abnormalities produced thereby on the host, *A. elatius*.

Studies on the dying out of pepper vines in the Dutch East Indies.—I, Summary of previous investigations, A. A. L. RUTTERS (Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 18 (1915), pp. 28).—A general survey is given of pepper culture in the Dutch East Indies, more particularly of pepper diseases of economic importance, with special mention of results reported by some investigators in this and neighboring regions. Mention is made of a wilt disease associated with the presence of a fungus in the wood vessels. In some regions nematodes have been found in the roots of the plant. The connection between the above mentioned parasites and the losses associated therewith has not yet been determined. Results obtained from studies at the government farm at Taliperamba (Madras) emphasize the importance of the method of manuring and cultivating in connection with the premature dying of pepper vines.

Bacterial rot of stored potato tubers, C. M. HUTCHINSON and N. V. JOSHI (Mem. Dept. Agr. India, Bact. Ser., 1 (1915), No. 5, pp. 113-135, pls. 5).—It is stated that four species of bacteria are found to be concerned in the rotting of potato tubers in India. One of these, numbered but not named, is invariably present in the rotting tubers examined. Infection takes place from without, differing in this respect from that due to *Bacillus solanacearum*. Preventive measures include the avoidance of mechanical injury in handling, storing in dry, coarse sand after immersion in 2 per cent copper sulphate solution with subsequent drying and periodical inspection to prevent infection of sound tubers.

A pathological and physiological study of the black heart of potato tubers, E. T. BARTHOLOMEW (Centr. Bakt. [etc.], 2. Abt., 43 (1915), No. 19-24, pp. 699-639, pls. 3).—The author's preliminary studies (E. S. R., 30, p. 149) have been followed up by further studies of the injury and its causation.

It is stated that black heart of potato is produced, not by a parasitic organism but by abnormal physiological changes. It may be produced artificially by subjecting the tubers to a temperature of from 38 to 48° C. (100.4 to 118.4° F.), the optimum being 42 to 44°, and the optimum period of time being 15 to 20 hours. All of the 16 varieties experimented with proved to be susceptible to this trouble, which may be prevented by supplying sufficient oxygen during the period of heating, for which purpose a constant stream of air is not sufficient. The tissues do not blacken if the potatoes are kept in an atmosphere devoid of oxygen after removal from the oven. Affected tubers, if not cut open, form after seven to ten days an increasing hollow in the center due to the shrinkage of the tissue. This can not be detected from an outside view. The colors produced, which range from light pink to coal black, are thought to be due to the presence of an oxidizing enzyme, tyrosinase, and a chromogen, trosin, which interact in the presence of free oxygen and are found in both normal and abnormal tissues of the potato tubers. The amino acid content increases greatly during the period of heating. The discoloration is said to be due to the presence of a substance known as melanin or humin.

The formation of black heart may be prevented by proper ventilation and the maintenance of a temperature not above 35°.

Late potato blight in Iowa, A. T. ERWIN (Iowa Sta. Bul. 163 (1916), pp. 285-306, figs. 8).—The result is given of an investigation of the late blight of potato, particularly with reference to the influence of moisture supply, humidity, and temperature. Three pronounced outbreaks of the late blight are reported to have occurred in Iowa during the past 45 years. These were in 1885, 1903, and 1915.

In studying the meteorological conditions in connection with outbreaks of this disease, the author claims that the climatic conditions in Iowa are generally unfavorable to such outbreaks, but that they sometimes cause serious loss. The climatic conditions under which late blight occurs in Iowa are a high degree of humidity with heavy dews and midsummer temperatures lower than usual. An excess of rainfall and a predominance of cloudy weather are predisposing factors.

Some notes are given on disease-resistant varieties, the spread of the disease through seed infection, storage qualities of infected potatoes, and the effect of time of planting on the degree of injury. Diseased potatoes, it is claimed, may be held in storage at a very slight loss from dry rot if the temperature is sufficiently low and the potatoes are taken out of storage only a short time before they are used. Early planting and the use of Bordeaux mixture are considered effective measures for preventing late blight in Iowa.

Straight head in rice. F. C. QUEREAU (*Louisiana Stas. Rpt.* 1915, p. 31).—The author gives a brief account of a disease or condition in rice which seems to occur on soils containing an abundance of vegetable matter. It is not definitely known whether the disease is due to physical conditions or to some specific organism. The only preventive treatment at present known is to delay the initial irrigation as long as possible, or, if necessary to irrigate because of weeds or grass, to drain the land about 15 days after the first flooding, allowing it to become perfectly dry. In a number of cases, this treatment is said to have prevented the condition designated as straight head.

A disease of sugar beets. P. BERTHAULT (*Jour. Agr. Prat.*, n. ser., 28 (1915), No. 56, pp. 550, 551, figs. 2).—It is stated that in the region around Paris and northward, industries dependent upon the sugar-beet crop have been considerably affected of late by the development of unusual virulence in the attacks of *Cercospora beticola*, which has previously appeared in this district but generally in mild form. Changes in coloration and inferior growth are associated with injuries to the leaf tissue.

***Cercospora beticola* attacking sugar beets.** E. SAILLARD (*Compt. Rend. Acad. Sci. [Paris]*, 162 (1916), No. 1, pp. 47-49).—The author discusses the unusual attacks by *C. beticola* on sugar beets in 1915 and the effects thereof on beet products, some of which were considerably altered in their proportions, as shown by comparative tables for 1915 and some earlier years.

A disease of sugar beets. A. MORVILLEZ (*Jour. Fabric. Sver.*, 56 (1915), No. 11, pp. 1, 2).—The author considers the losses to the sugar-beet industry in 1915 as due primarily and largely to insufficient nutrition.

Sugar beet disease. P. BERTHAULT (*Jour. Agr. Prat.*, n. ser., 29 (1916), No. 2, pp. 35, 36).—The author, discussing the above contributions by himself, Sallard, and Morvillez, considers the attack by *Cercospora beticola* and the associated abnormal chlorosis as closely related phenomena, the latter being probably dependent upon the former.

Internal action of chemicals on resistance of tomatoes to leaf diseases. J. B. S. NORRON (*Maryland Sta. Bul.* 192 (1916), pp. 17-30, fig. 1).—After reviewing the literature describing the effect of soil applications, direct injection, and the use of serums and toxins for the prevention of plant diseases, the author describes some experiments carried on in 1912 and 1913, in which about 50 chemicals were employed to determine their effect on infection of tomatoes by *Septoria lycopersici* and *Cladosporium fulvum*.

The plants were grown in paraffin-covered paper pots suspended in glass tumblers above solutions of different proportions of the various chemicals, their roots extending downward to the solution of the chemical, which did not come in contact with the soil.

In a few instances, there was some indication that concentrations lower than those causing injury might reduce the development of the leaf parasites to some extent. This was true of potassium nitrate, sodium acetate, morphine sulphate, calcium nitrate, copper sulphate, lime water, sodium tungstate, and potassium permanganate. In some cases there was less leaf disease developed, particularly in case of *S. lycopersici*, on the higher concentrations where these were not strong enough to cause injury, but in general the results were negative.

Some orchard diseases and their treatment, C. R. O'BROX (*Proc. State Hort. Assoc. Penn.*, 55 (1914), pp. 43-56, pls. 6).—The author discusses some of the more destructive orchard diseases prevalent in Pennsylvania, the number of which has greatly increased during recent years, naming their several orchard and wild hosts, describing their symptoms, and pointing out various control measures. Those taken up are fire blight (*Bacillus amylovorus*), bitter rot (*Glomerella rufomaculans*), black rot (*Spharopsis malorum*), apple rust (*Gymnosporangium juniperi-virginianæ*), orange rust of quince (*G. germinate*), and brown rot of peach, plum, and cherry (*Sclerotinia cinerea*), with mention of others of less importance.

Experiments with rust and *Coryneum* of fruit trees, A. CADORET and A. DESMOULINS (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 46, pp. 468-471).—Discussing the characters, importance, and extension of these two diseases, also tests with remedial measures made or reported, the authors conclude that the higher concentrations of the sprays sometimes used are unnecessary, 2 per cent being considered as sufficient for Bordeaux mixture or neutral copper acetate. The materials added to the sprays to increase their capacity for spreading and adhesiveness do not appear to have been very successful except in case of gelatin added to copper acetate. Lime sulphur sprays are said to have been very inferior in their results to the preparations based on copper.

The development of perithecia in *Venturia inaequalis*, K. KILLIAN (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 4, pp. 164-168, figs. 2).—The author gives an account of his observations, so far as completed, on the developmental history, in relation to apple leaves, of *Fusicladium dendriticum* (the conidial stage of *V. inaequalis*) associated with apple and pear scab.

Influences affecting cherry culture, SPEENGER (*Cultura*, 27 (1915), No. 325, pp. 291-295).—Among the conditions mentioned as influencing returns from cherry culture in southerly portions of the Netherlands are various biological, physiological, and weather conditions, and pathological fungi, including *Monilia*, *Coryneum*, *Valsa leucostoma*, and *Armillaria mellea*.

Common diseases of the grape, M. T. COOK (*New Jersey Stas. Circ.* 55 (1916), pp. 3-8, figs. 2).—Descriptions are given of some of the more common diseases of the grape and suggestions offered for their control.

A brief report is also presented of grape-spraying experiments in 1915, in which an early spraying was given certain plots, and the results contrasted with those from plots sprayed as in the general practice in that vicinity. The plots receiving the extra spraying were given six applications, the first early in May, while the others received five applications, beginning June 17. At harvest, rows were selected for measurement from the different plots, and those which had received the extra spraying in May yielded an average of 66.5 baskets, or 25 baskets per four rows more than those treated in the ordinary manner.

A vine disease due to a *Hypochnus*, A. LENDNER (*Bul. Soc. Bot. Genève*, 2, ser. 6 (1914), No. 4, pp. 104-106, fig. 1).—A fungus described as *H. burnati* sp. is considered as secondarily parasitic or saprophytic on grapevines. It may be related to the lime content in the soil.

[Reports on grape downy mildew] (*Rev. Vit.*, 43 (1915), Nos. 1096, pp. 11, 18; 1097, pp. 31-33; 1098, pp. 48, 49; 1099, pp. 64-69; 1100, pp. 73-88; 1101, pp. 93-107; 1102, pp. 113-120; 1103, pp. 133-143; 1104, pp. 153-168; 1105, pp. 173-184; 1106, pp. 206-209; 1107, p. 229; 1108, pp. 233-242; 1109, pp. 253-260; 1110, pp. 278-285; 1111, pp. 296-301; 1112, pp. 316-322; 1113, pp. 336-338; 1114, pp. 350-356; 1115, pp. 388-392; 1117, p. 410; 1119, pp. 447-450; 1120, p. 465].—This series of articles is made up of information and suggestions received during the latter part of 1915 from correspondents at numerous points in France and some in neighboring countries regarding the appearances, phenomena, and effects of grape downy mildew, and regarding such related or unrelated factors as insects, black rot, weather conditions, and susceptibility, with some discussion of experiences and observations during previous years.

Downy mildew in Aude, F. CAZENAVE (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 34, pp. 188-190).—The author reports that 10 sprayings with Burgundy mixture containing 2 per cent copper sulphate applied during the period from May 12 to August 12 gave adequate protection against downy mildew.

Downy mildew on direct-bearing grapevines, S. OBIEDOFF, J. BAQUERO, and D. V. PEHLIVANOGLOU (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 30, pp. 82-88; 31, p. 117, figs. 2).—This is a report on the phases and degrees of recent attack by grape downy mildew on direct bearers which have been considered as nearly or quite immune to such attack. Only very limited number, however, are said to have proved resistant.

Causes of success or failure of grape downy mildew, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 32, pp. 125-130).—The author discusses the employment of different concentrations and frequencies in the sprays used against grape downy mildew, and the probability of the development of a strain of this fungus more than ordinarily resistant to fungicides.

Treatment for downy mildew in rainy years, G. HÉRON (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 34, pp. 185-188).—The author's observations are said to indicate that in years of heavy rainfall a solution of 2 to 3 per cent copper content is preferable to the usual strengths used in copper sprays. Of these sprays Burgundy mixture is preferred, especially in the acid form, which is said to maintain on leaves and fruits a certain amount of soluble copper. It is thought prudent to apply after heavy rains a simple treatment consisting of a 0.4 or 0.5 per cent solution of copper sulphate. It is suggested that cupric powders may also be profitably employed.

Copper fungicidal powders, H. FONZES-DIACON (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 28, pp. 37-41).—It is claimed that acid powders contain copper soluble in water, which is capable of exercising immediate fungicidal action upon mildew spores and also copper soluble in water containing carbon dioxide, which is also capable of acting upon the spores, but more slowly. Too high acidity may scorch both leaves and fruits. Neutral powders contain copper more or less readily soluble in rain water charged with carbon dioxide, giving a slower fungicidal effect. The alkaline powders do not seem to be effective in this regard.

The influence of temperature on decomposition in Bordeaux mixture, O. BUTLER (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 36 (1915), No. 27, pp. 15-18, pl. 1).—A discussion is given of differences in the properties and effects of Bordeaux mixture corresponding to variations in the composition, temperature during preparation, and age of the mixture.

Treatment of grapevines with hot water and hot sprays, L. SEMICHOX (*Rev. Vit.*, 43 (1915), No. 1096, pp. 9-12).—This is mainly a reply by the author to some criticisms of the claims regarding the real temperatures of hot water

when used as fungicide or insecticide as previously discussed (E. S. R., 32, p. 447; 34, pp. 50, 243).

Treatment of vines and vegetation with hot water, L. SEMICHON (*Rev. Vit.*, 43 (1915), No. 1118, pp. 413, 414, fig. 1).—Results are presented in numerical and graphical form of the relation found to exist between the distance from the nozzle and the lowering of the temperature in case of sprays applied with nozzles of different kinds and sizes.

Theory of temperature change in hot sprays, A. CHAUVIENÉ (*Rev. Vit.*, 43 (1915), No. 1118, pp. 415-417, fig. 1).—This article reports a study along lines similar to the above. It is stated that the lowering of the temperature is not constant throughout the length of the jet, the maximum rate of temperature decrease being attained at 20 cm. (7.8 in.) from the orifice of the nozzle in the experiments reported.

Theory and practice in regard to the cooling of hot sprays, L. SEMICHON (*Rev. Vit.*, 43 (1915), No. 1118, pp. 417-419).—This is a discussion of the above notes, including supposedly variable unknown factors.

Brusca of olive, G. POLLACCI (*Atti Ist. Bot. R. Univ. Pavia*, 2. ser., 9 (1911), pp. 26-28).—Two fungi described as new species on olive leaves are named *Coniothyrium olea* and *Septoria oleae*.

Cacao and its local diseases, T. G. GROULFO (*Philippine Agr. and Forester*, 3 (1915), No. 8, pp. 162-172).—Giving the results of a study of cacao culture in the Philippines, particularly in the region around the College of Agriculture, the author discusses various cacao pests and diseases. The fungi which are found to be very commonly injurious are the Diplodia or Lasiodiplodia form of *Thyridia tarda*, *Phytophthora omnivora*, *Nectria theobroma*, and *N. vannii*.

Bordeaux mixture, if applied thoroughly and in time, is said to be very satisfactory for both fungus pests and insect enemies of cacao. Necessary or helpful conditions for successful cacao culture are general sanitation, seed selection, spacing, fertilization of the soil, early pruning, and destruction of affected parts.

Coconut bud rot, J. B. ROMÉ (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 4, pp. 129, 130).—In a summary of a report on the work done to date in connection with bud rot, it is stated that experiments at Roxborough, Tobago, and Toco, Trinidad, indicate that frequent spraying with Bordeaux mixture can be relied upon to prevent serious attack by this disease if the crowns of the trees are not over 15 to 18 ft. from the ground. The infected portions are chiefly the bases of the leaves, the flower stalks, the spathes, and the whole of the soft upper portion of the stem.

The claim that *Bacillus coli* is the cause of bud rot is said to be undergoing tests.

A study of native coffee production, F. D. LUISTRO (*Philippine Agr. and Forester*, 3 (1915), No. 8, pp. 153-161).—This is a discussion of coffee culture in the Philippines, including the decrease during recent years in the output with its causes and their possible remedies, as manuring, pruning, and more particularly, spraying.

It is stated that experiments carried out in the Lipa and the Los Baños districts, where *Hemileia vastatrix* is said to be the most destructive coffee disease, show that a considerable saving was effected by the use of Bordeaux mixture. Pruning is said to lessen the degree of infection.

A brief bibliography is appended.

A coffee disease in Mexico, R. FARNETI (*Atti Ist. Bot. R. Univ. Pavia*, 2. ser., 9 (1911), pp. 36, 37).—A disease of coffee in Cuicatlán, in the Mexican State of Oaxaca, is ascribed to a fungus described as *Cercospora herrerana* n. sp., which is contrasted with *C. coffeicola*.

A new Cylindrosporium, M. TURCONI (*Atti Ist. Bot. R. Univ. Pavia*, 2, *ser.*, 9 (1911), pp. 28-30).—*C. pollacci* n. sp. is the name given to a fungus parasitic on *Ilex furcata*.

The hydropsy of **Madake** (*Phyllostachys bambusoides*), S. KAWAMURA (*Extracts from Bul. Forest Expt. Sta., Tokyo*, 1915, pp. 127-130, figs. 4).—Madake has recently been increasingly affected with a disease characterized by accumulations of water in the stem, especially the middle portions, but not in the uppermost internodes. The leaves gradually fall and the stem becomes weak and unfit for use. The symptoms and their alterations are described in some detail. The cause of the trouble has not been determined.

The red plague of **Sugi** (*Cryptomeria japonica*) seedlings, S. KAWAMURA (*Extracts from Bul. Forest Expt. Sta., Tokyo*, 1915, pp. 131-133, fig. 1).—It is stated that since the red plague of Sugi became known a few years ago in Japan, the trouble has spread until it has now been reported from various parts of the country. The symptoms of the disease are described.

The author's investigations since 1911 have led to the conclusion that the disease attacks only this plant and is confined to seedlings under five years of age. Of the three fungi noted in this connection, *Pestalozzia* appears to be usually associated with other fungi, mostly on old, decayed leaves, and *Cercospora* is still under investigation, so that this report is confined chiefly to a discussion of *Phyllosticta*. The fungus attacks first the lower and then the higher leaves, causing discoloration, and later the twigs, causing dark brown spots on the surface, and eventually killing the leaves, causing complete failure of growth.

A disease of immortal trees, J. B. ROBER (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 4, pp. 128, 129).—A disease affecting *Erythrina velutina* is described, in which the leaves show first a pale green, then a yellow color. This is followed by a dieback, the branches falling away gradually and the bare, dead trunk finally rotting and falling to the ground. This occurs in widely separated groups of from 10 to 20 or more trees. Often, though not always, the cacao trees under the dying immortal trees are affected in much the same manner. The trouble may be connected with insufficient drainage. No parasites have yet been shown to produce the disease, and the symptoms suggest root trouble, poor soil conditions, or bad water relations. Deep and thorough drainage appears to be the best means of control.

Hypodermis deformans, an undescribed needle fungus of the western yellow pine, J. R. WEB (*U. S. Dep't. Agr., Jour. Agr. Research*, 6 (1916), No. 8, pp. 277-288, pl. 1, figs. 4).—A technical description is given of *H. deformans* n. sp., which is said to cause a serious needle disease of the western yellow pine (*Pinus ponderosa*) in parts of Idaho, Washington, and Montana.

The fungus is said to be a true parasite, attacking the foliage of all age classes. The first sign of infection is usually a slight browning of the tips of the needles, or, in regions of heavy infection, the entire needle may assume a straw yellow color deepening to a brown on the first appearance of the apothecia. The terminal shoots do not attain their normal development, and witches' brooms are frequently produced.

The author considers this fungus a possible cause of disease in nurseries, although, up to the present time, it has not been found in the forest tree nursery. Cutting out and burning the infected parts or trees are recommended as means of control.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Animal guide; North American wild animals, C. K. REED (*Worcester, Mass.: Author*, 1915, pp. 253, figs. 60).—This small pocket guide includes descrip-

ons of 60 North American wild animals illustrated in color from original tintings by H. F. Harvey.

A list of British birds compiled by a committee of the British Ornithologists' Union (London: British Ornithologists' Union, 1915, 2. rev. ed., pp. XII+430).—This is the second revised edition of the British Ornithologists' Union list, the first of which was published in 1883. Under each species are given the common name, synonymy, distribution in the British Isles, and general distribution. The appendices include a list of species which have been recorded as having been found in the British Islands, but on evidence which the committee do not regard as entirely satisfactory; a list of names which in the opinion of the committee should be retained, together with the corresponding names under the Rules of Nomenclature as drawn up by the International Congress of Zoology at their successive meetings; and a discussion of the reasons for the change of old names or for the nonadoption of changes which have been advocated by recent authors, together with the method of fixation of the types of the various genera used in the list.

Birds of the Indian hills, D. DEWAR (London and New York: John Lane, 1915, pp. 264).—The several parts of this popular work deal with the birds of the Himalayas, the common birds of the Nilgiris, and the common birds of the Paint Hills. The vernacular names of Himalayan birds and of Nilgiri birds are given in appendices and a subject index is included.

The entomological and ornithological collector's handbook, J. SINCLAIR (Los Angeles, Cal.: Author, 1915, pp. 80).—A handbook of information for collectors.

Agricultural entomology, II. OSBORN (Philadelphia: Lea and Febiger, 1916, pp. IV+17-347, pl. 1, figs. 252).—This work has been prepared for the use of students, farmers, fruit growers, and gardeners.

Insect pests of Lima beans in St. Vincent, S. C. HARLAND (Agr. News [Barbados], 14 (1915), Nos. 352, pp. 346, 347; 353, p. 363).—An undetermined Cryptorhynchus borer; the bean leaf roller (*Eudamus proteus*), held in check by parasites; an undetermined leaf blotch miner; and the larvae of an undetermined moth are said to be the most important enemies of Lima beans in St. Vincent.

Insect pests of the orchards and gardens of Idaho and their control, W. C. MUNDSON (Idaho Sta. Bul. 87 (1916), pp. 80, figs. 12).—A popular descriptive account with control measures.

The insects injurious to fruit trees, P. LESNE (Jour. Agr. Prat., n. ser., 28 (1915), Nos. 41, pp. 312-314, pl. 1; 42, pp. 327, 328; 53, pp. 503-506, pl. 1; 56, pp. 5-56).—A general account of insects attacking fruit trees, accompanied by larval plates of the more important forms.

[Citrus insects in the Isle of Pines], F. S. EARL and J. M. ROGERS (Sancti [Isle of Pines] Citrus Path. Lab. Ann. Rpt., 1 (1915), pp. 11-21, figs. 2).—A account of the more important citrus insects and means for their control.

The locust borer (*Cylleene robiniae*) and other insect enemies of the black locust, H. GARMAN (Bien. Rpt. State Forester Ky., 2 (1915), pp. 32-63, pls. 1).—The locust borer, an extended account of which by Hopkins has been previously noted (E. S. R., 18, p. 159), is said to occur throughout Kentucky, its numbers being in proportion to the abundance of locust trees. Biological observations of this beetle and its natural enemies are reported.

It is pointed out that since the adults are dependent on goldenrod pollen and are abundant only where it may be secured, the destruction of goldenrod in the vicinity of plantings or the spraying thereof with arsenate of lead about the middle of September are valuable means of lessening the injury. As a

further precaution the spraying of the trunks of trees with lead arsenate about the first of September when the beetles begin to emerge from the trees is suggested and the destruction of old badly-infested locust trees in the vicinity of plantings is recommended.

The other insects mentioned as infesting the wood of the trees include the carpenter moth (*Prionoxystus robiniae*), the twig miner (*Ecdytolopha insiticiana*), and *Agrius egnus*. Several insects mentioned as attacking the young twigs and leaves include the leaf miners, *Chalepus dorsalis*, *C. nervosa*, *Gracilaria lespedezæfoliella*, *Lithocoetes ostensackenella*, and *L. robiniae*; the locust leaf skeletonizer (*Gelechia pseudacaciella*); and the locust skipper (*Eudamus tityrus*). Under the heading of puncturing insects several tree-hoppers, etc., are mentioned.

Twenty-eighth report of the state entomologist on the noxious and beneficial insects of the State of Illinois, S. A. FORBES (*Rpt. State Ent. Ill.*, 28 (1915), pp. IX+106, pls. 4, figs. 24).—This report consists of the following papers: Recent Illinois Work on the Corn Root Aphid and the Control of its Injuries (pp. 1-62) (E. S. R., 33, p. 60), Observations and Experiments on the San José Scale (pp. 63-79) (E. S. R., 33, p. 452), and Life History and Habits of the Northern Corn Rootworm (*Diabrotica longicornis*) (pp. 80-86) by S. A. Forbes; and the San José Scale (*Aspidiota perniciosus*), by P. A. Glenn (pp. 87-106) (E. S. R., 34, p. 162). The paper on the northern corn rootworm is based upon miscellaneous observations and operations of several years.

Forty-fifth annual report of the Entomological Society of Ontario, 1914 (*Ann. Rpt. Ent. Soc. Ontario*, 45 (1914), pp. 152, figs. 27).—This annual report consists of Reports on Insects of the Year, by A. Gibson (pp. 13-28); Applied Entomology in Canada: Its Rise and Progress, by C. G. Hewitt (pp. 29-41); Insects of the Season in Ontario, by L. Caesar (pp. 42-49); The Habits of Spiders, by J. H. Comstock (pp. 49, 50); Brief Notes on Some of the Injurious Insects of Quebec, 1914, by W. Lochhead (pp. 59-61); Insects Injurious in Southern Quebec, 1914, by C. E. Petch (pp. 70, 71); The 1914 Outbreak of the Army Worm in Canada, by A. Gibson (pp. 72-75), substantially noted (E. S. R., 35, p. 56); The Army Worm in Ontario in 1914, by A. W. Baker (pp. 75-80); Experiments with Poisoned Bran Baits for Locust Control in Eastern Canada, by A. Gibson (pp. 97-102), substantially noted (E. S. R., 35, p. 56); An Imported Red Spider Attacking Fruit Trees, by L. Caesar (pp. 102-107) (E. S. R., 33, p. 659); Cherry Fruit Flies, by L. Caesar (pp. 107-112), substantially noted (E. S. R., 33, p. 561); The Control of Forest and Shade Tree Insects of the Farm, by J. M. Swaine (pp. 112-116); etc.

The theory of wetting, and the determination of the wetting power of dipping and spraying fluids containing a soap basis, W. F. COOPER and W. H. NUTTALL (*Jour. Agr. Sci. [England]*, 7 (1915), No. 2, pp. 219-239, figs. 3).—An extended discussion of the subject, including a review of the literature and a list of 20 references.

Common spray materials and other insecticides. J. G. SANDERS (*Wks. Dept. Agr. Bul. 3* (1916), pp. 22, figs. 9).—This is a popular treatise.

Locusts or grasshoppers. F. W. URECH (*Bul. Dept. Agr. Trinidad and Tobago* 14 (1915), No. 4, pp. 120-128, pl. 1).—Brief notes are given on the occurrence of locusts in Trinidad and methods of combating them, together with an account of locust destruction in South Africa.

Combating locusts. TRABUT (*Bul. Agr. Algérie, Tunisie, Maroc*, 21 (1915) No. 3, pp. 53-74, figs. 16).—A discussion of the methods of combating migratory locusts and of their natural enemies.

Thrips oryzæ n. sp., injurious to rice in India, C. B. WILLIAMS (*Bul. Ent. Research*, 6 (1916), No. 4, pp. 353-355, fig. 1).—This species is reported to be injurious to young rice.

What cacao thrips signify in Grenada, H. A. BALLOU (*Agr. News [Barbados]*, 14 (1915), No. 350, pp. 314, 315).—The cacao thrips (*Heliothrips rubrocinatus*) probably occurs in all parts of Grenada, where it was first found in 1898, and may occur in every cacao field. Attacks occur year after year on the same areas, on the same trees even, sometimes spreading a little, but a thrips area one year is liable or certain to be a thrips area every year, although it may never increase in numbers sufficiently to attract attention or cause any injury.

It is suggested that the cacao thrips should be considered a useful insect since it may indicate that the trees are suffering from untoward condition, thus serving as an indicator. When thrips areas have been examined, it has been found that root disease was present, the drainage was insufficient, the soil was shallow with terrace or heavy clay beneath, or there was evidently a lack of humus in the soil.

A new thrips damaging coffee in British East Africa, C. B. WILLIAMS (*Bul. Ent. Research*, 6 (1915), No. 3, pp. 269-272, fig. 1).—*Diarthrothrips coffee* n. g. and n. sp. is said to have caused serious damage to the leaves of coffee in several districts of British East Africa.

Egg and manner of oviposition of *Lyctus planicollis*, T. E. SNYDER (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 7, pp. 273-276, pls. 1).—Species of the genus *Lyctus* are said to be by far the most important of the various beetles which cause the so-called "powder-post" injury to seasoned wood products so widely distributed over the world. The observations of *L. planicollis* here described were made at Washington, D. C., and Falls Church, Va.

The winter is passed in the larval stage, general pupation occurring about the first of April; the pupal cell is excavated near the surface of the wood, and in this cell the larva retreat after cutting a transverse burrow nearly to the surface for the exit of the adults. The general emergence of adults takes place during May. Oviposition began a few days after mating and was observed to take place principally during the middle of May in 1915. On May 24 many beetles were observed on radial sections of wood with their ovipositors deeply inserted into the open pores or large longitudinal vessels in the wood. The beetles seem to prefer to oviposit on those sections of seasoned sapwood where the open ends of pores are most numerous. Recently hatched larvae were first observed on June 1, the period of incubation being 10 days at most.

It is stated that the injury by "powder-post" beetles to unfinished seasoned wood products can be prevented by simply adapting a system of inspection, classification, and methods of disposal of stock to facts in the seasonal history of the insects, as has been recommended by Hopkins (E. S. R., 24, p. 256). In the case of finished wood products it may often be practicable to treat the wood with substances to prevent attack. Judging from the facts in the seasonal history of this species, preventives should be applied before March 1.

The mealy bug of the muscat grape, F. K. HOWARD (*Mo. Bul. Com. Hort.*, 5 (1916), No. 2, pp. 67, 68, fig. 1).—The infestation of table and wine grapes in the grape-growing section of the San Joaquin Valley by the mealy bug, probably *Pseudococcus bakeri*, first became of economic importance in 1914. It was first found on raisin grapes in an old muscat vineyard near Armona, Kings County, Cal., in September, 1915. Up to the time of writing no satisfactory control measure had been worked out.

Phylloxera (*Dept. Agr., Indus., et Com. [Vaud], Raps. Sta. VII. et Ser. Phylloxérique, 1912, 1913, and 1914, pp. 64, each*).—Reports on the reconstitution of vineyards and control work with phylloxera in the Canton of Vaud.

Notes on Samoan Coccidae with descriptions of three new species, R. W. DOANE and G. F. FEIRIS (*Bul. Ent. Research*, 6 (1916), No. 4, pp. 399-402, figs. 3).—Notes are given on the occurrence of Coccidae in Samoa, together with descriptions of three species new to science.

On a new coccid pest of cacao from *Trinidad*, E. E. GREEN (*Bul. Ent. Research*, 6 (1916), No. 4, pp. 377-379, figs. 3).—*Philepsherda theobromae* n. sp. collected on pods of *Theobroma cacao* in Trinidad and attended by the ant *Aztec chartifex*, is described as new.

On a coccid injurious to pine trees in the *Himalayas*, E. E. GREEN (*Bul. Ent. Research*, 6 (1916), No. 4, pp. 395-397, pl. 1, figs. 3).—*Ripertia resiniphile*, which was found to occupy gummy cells of growing shoots of *Pinus longifolia* and *P. excelsa*, is described as new to science.

The soft bamboo scale (*Asteroecanum bambusae*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 5 (1916), No. 2, pp. 72, 73, fig. 1).—The author records the discovery of the establishment of this pest in the United States for the first time, at Ventura, Cal., in March, 1914, and at Sierra Madre in 1915.

How to control the cottony maple scale, J. G. SANDERS (*Wis. Dept. Agr. Circ.* 2 (1916), pp. 4, figs. 3).—A brief popular account.

Studies of comparative lepidopterology, C. OBERTHÜR (*Études de Lépidoptérologie Comparée. Rennes: Author, 1913, Nos. 7, pp. 679, pls. 171; 8, pp. 88, pls. 40; 9, pt. 1, pp. 44, pls. 9; 1914, No. 9, pt. 2, pp. 180, pls. 56, figs. 6; 1915, No. 10, pp. 459, pls. 152, figs. 42*).—A continuation of the work previously noted (E. S. R., 28, p. 453).

Life-histories of Indian insects.—V, Lepidoptera, C. C. GHOSH (*Mem. Dept. Agr. India, Ent. Ser.*, 5 (1914), No. 1, pp. 72, pls. 9, fig. 1).—This part (E. S. R., 31, p. 159) deals with the butterflies.

A butterfly injurious to coconut palms in *British Guiana*, L. D. CLEARE JR. (*Bul. Ent. Research*, 6 (1915), No. 3, pp. 273-278, pls. 3, fig. 1).—The larva of the coconut butterfly (*Brassolis sophore*) is reported to have severely attacked coconut palms in the vicinity of Georgetown during 1914. All of the green parts of the leaves were devoured, only the thick central midrib and fine lateral veins being left. Studies of its histology, natural enemies, etc. are reported.

The possibilities of sericulture in British colonies and dependencies, with special reference to the rearing of wild and semiwild silkworms (*Bul. Imp. Inst. [So. Kensington], 13* (1915), No. 1, pp. 87-110).—An extended discussion.

The potato moth (*Phthorimaea operculella* [*Lita solanella*]).—Results of spraying experiments in Gippsland, C. FRENCH, JR., and S. G. HARRIS (*Mo. Dept. Agr. Victoria*, 13 (1915), No. 10, pp. 614-618, figs. 2).—This pest has caused considerable loss to growers and is deemed the worst potato pest in Victoria. Due to exceptionally dry weather in Gippsland and elsewhere during the past two seasons, the moths have been exceedingly abundant and the damage caused has been very great. In some cases the whole crop has been destroyed when the plants were from 4 to 6 in. high, and in many instances the growers had discarded fully two-thirds of the tubers when bagging, owing to the depredation of the caterpillars. Experimental applications of lead arsenate to the foliage are said to have given quite beneficial results.

The grape berry worm (*Polychronis viteana*), W. H. GOODWIN (*Ohio St. Bul.* 293 (1916), pp. 259-307, figs. 39).—This lepidopteran, described from the United States in 1860 as *P. viteana*, resembles the European grape pest *botrana* anatomically, although the differences in its life history and habi-

and minor anatomical differences have led to its recognition as a distinct species. It has been unusually destructive at various times in those sections of New York, Pennsylvania, and Ohio where grapes are the predominating crop, and has also been a pest in other States.

The studies of its life history and of control measures, here reported, have extended over a period of several years. The pest was found to be two-brooded, completing its life cycle twice each year. Moths transforming from the overwintering pupae emerge throughout a period of from 20 to 30 days in June and July, making the periods during which the eggs hatch of equal duration.

"Earliest publications have recommended three sprayings, one just before bloom, a second when the grapes are about as large as peas, and a third about July 10 to 15. The recent and complete life-history studies have shown that by following this program the three sprayings for berry-worm control were made before the first-brood larvae were grown. The third spraying from July 10 to 15 was made almost a month before the eggs of the second brood of berry worms for the season were hatched, leaving small probability of sufficient poison adhering at this time to kill many of these newly-hatched worms.

"By timely, thorough spraying, in accordance with the known life-history development, the berry worms have been controlled, their injuries being reduced to an almost negligible amount. These sprayings should be extremely thorough. Arsenate of lead 4 lbs., Bordeaux 2:3:50, and 2 lbs. of dissolved soft soap should be used for the first spraying just after the blooming of the grapes, when the largest berries are about 0.125 in. in diameter. This poison spray kills many of the first-brood worms.

"The second spraying must be made just preceding the placing of the moth eggs on the grape berries and stems of the berries. In normal years the time of this spraying comes between August 3 and 12, depending upon whether the grapes bloom earlier or later than normally, or about seven weeks after the grapes bloom. This time can also be determined by placing a lot of wormy grapes in a jar about 20 with leaves on top of the berries; tie a piece of cloth over the top of the jar and place it outdoors in the shade. Spraying for the control of the second-brood worms must be started about ten days after the first-brood worms begin to spin cocoons on the grape leaves. Use arsenate of lead paste 6 lbs., Bordeaux 2:3:50, and dissolved soft soap 2 lbs., covering every bunch with spray, applying it preferably by hand."

Life-history studies of this insect, by Johnson and Hammar, have been previously noted (E. S. R., 28, p. 453).

Ormix geminatella, the unsotted tentiform leaf miner of apple. L. HASEGAN (U. S. Dept. Agr., Jour. Agr. Research, 6 (1916), No. 8, pp. 289-296, pl. 1).—This leaf miner is said to have been extremely abundant in Missouri in recent years, and has attracted the attention of fruit growers throughout the State. Its attack has largely been confined to bearing apple orchards, though considerable injury has been done to apple foliage in nurseries. Its importance is considerably lessened due to its being most abundant in the late summer and early fall.

The moth was first described and figured by Packard in 1869 as *Lithocolletes geminatella* and was reported by him to be abundant in New England on pear and apple. It has since been reported by entomologists as very abundant on apple in New York, as common in Connecticut, and as occurring in a number of other States.

In the present paper the author reports observations being made at the Missouri Experiment Station of its life history and habits. The egg is so small that

the author has failed to detect it on foliage. The larva always seems to break through the part of the shell which is cemented to the leaf and enters the leaf tissue at once. In the course of its development the larva molts three times, the first of which takes place on the third day and the second on the seventh or eighth day, the larval life in the mine being about two weeks. After vacating the mine through a small hole in its floor the larva crawls about for a varying length of time before making a cocoon in which to pupate. The cocoon is almost invariably placed on the upper surface along the edge of the leaf or at its very tip. Pupation takes place soon after the cocoon is completed, the pupal period varying from a few days to a week in midsummer. In the spring the adults are abundant by the first week in May. By the middle of the month the typical tentiform mines begin to appear, and the adults of the first spring brood begin to emerge by the last of May, the life cycle being completed in from four to five weeks. The broods overlap, but beginning with May a fairly well-defined brood can be made out for each month until November. The larva of the October brood pupate and live through the winter on fallen leaves.

While this leaf miner is primarily a pest of the foliage of the apple, the small caterpillars have also been found developing in considerable numbers in the leaves of the crab apple and occasionally in the leaves of the haw (*Crataegus* spp.), plum, cherry, and pear. Other authors report having reared it from mines in the leaves of wild cherry.

It is pointed out that since the caterpillar enters the leaf immediately at hatching and remains in the mine until mature and ready to spin its cocoon for pupating, arsenical and contact sprays are of little value in its control. Since it passes the winter as a pupa in cocoons on fallen leaves, it can be effectively controlled by destroying the leaves early in the spring, the most practical method being to use a disk for shallow cultivation before the first of March so as to work under the leaves before the moths begin to emerge. The pest is said to be heavily parasitized. The author reared a number of parasites from it, namely, *Sympiesis nigrifemora*, *S. tischeri*, *S. metcovi*, *Eulophus lineatocava*, *S. dolichogaster* and others which have not been identified.

Cutworms. H. T. FERNALD (*Massachusetts Sta. Circ.* 61 (1916), pp. 2).—A revision of Circular 43, previously noted (E. S. R., 32, p. 349).

Anopheles punctipennis, a host of tertian malaria, W. V. KING (*Amer. Jour. Trop. Diseases and Prev. Med.*, 3 (1916), No. 8, pp. 426-432, pl. 1).—Substantially noted from another source (E. S. R., 34, p. 358).

In a footnote the author states that it has been established that *A. punctipennis* is also an efficient host of the parasite of estivo-autumnal malaria, *Plasmodium falciparum*.

Experiments on the development of malaria parasites in three American species of *Anopheles*. W. V. KING (*Jour. Expt. Med.*, 23 (1916), No. 6, pp. 763-716, pls. 8).—This is a report of further experiments (see above) with the three most prevalent species of the genus occurring in the United States.

“As a result of these experiments *Anopheles punctipennis* is shown to be an efficient host of the organisms of tertian and estivo-autumnal malaria. *A. crucians* of estivo-autumnal malaria, at least, and information has been obtained upon the relative susceptibility of these two species and *A. quadrimaculatus*. The latter species has been known to be an efficient host since Thayer's experiments in 1900, and has been considered to be the principal species concerned in the transmission of malaria in the United States.

“With *A. punctipennis*, developmental forms of the exogenous or sporogenic cycle of *Plasmodium vivax* were demonstrated in six (85 per cent) of the

seven mosquitoes dissected, and the development of *P. falciparum*, in four (20 per cent) of twenty specimens. These four infections, however, occurred in a series of thirteen specimens fed on one person, so that the percentage was actually 33.

"With *A. crucians*, oocysts or sporozoites or both oocysts and sporozoites of *P. falciparum* were found in nine (75 per cent) of the twelve specimens dissected. No tests were made with this species and *P. vivax*.

"*A. quadrimaculatus* was employed as a control species in the experiments and became infected in the following ratio: Eight (66 per cent) of twelve specimens with *P. vivax*, and three (15 per cent) of nineteen specimens with *P. falciparum*.

"In determining the relative susceptibility of the three species only those individuals which had fed upon the same gamete carriers are considered. The number of mosquitoes from which the percentages are computed is too small to make the results entirely conclusive."

A bibliography of 15 titles is appended.

Anopheles punctipennis.—Its relation to the transmission of malaria; report of experimental data relative to subtertian malarial fever, M. B. MITZMAIN (*Pub. Health Rpts. [U. S.]*, 31 (1916), No. 6, pp. 301-307).—"Two hundred and nineteen specimens of *A. punctipennis* were dissected from 3 to 38 days after multiple bites on individuals whose blood contained varying numbers of subtertian gametocytes (estivo-autumnal crescents). No infection was observed in the dissection of stomachs and salivary glands.

"Two healthy individuals were bitten 91 and 180 times by specimens of *A. punctipennis*, 4 to 38 days after sucking blood of a subtertian malarial carrier. In this experiment, and subsequently in the employment of a healthy volunteer to feed 22 additional mosquitoes of this same species, *A. punctipennis* could not be incriminated in the transmission of subtertian malarial fever. The negative results in this experiment check only with the negative findings in the dissections of *A. punctipennis*, as it is recognized that the volunteers were not under absolute control; that is, because of the possible exposure to bites from infected anophelines while living in New Orleans.

"Control feedings with 74 specimens of *A. quadrimaculatus* resulted in an infection of 13.8 per cent, and with three specimens of *A. crucians* of 33.3 per cent. The coincidence in which one person developed subtertian malaria 11 days following the single bite of an *A. quadrimaculatus* that had become infected (as shown by dissection) 17 days previously by biting a heavily infected carrier, pointed strongly to this as the source of infection. This might be offered as an additional check in the experiment, recognizing, however, the limitations that might be placed on it because of lack of absolute control of the volunteer living in New Orleans."

Observations on the Culicidae. B. GALLI-VALERIO (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 76 (1915), No. 4, pp. 260, 261).—This note relates to the hibernation, biology, and breeding places of Culicidae in Switzerland.

Observations on the bionomics of *Stegomyia fasciata*, J. W. S. MACFIE (*Bul. Ent. Research*, 6 (1915), No. 3, pp. 205-229).—Notes on the author's observations of the yellow fever mosquito, relating to length of life, blood feeding, ovulation, intolerance of the larvae to common salt, etc., much of which data is presented in tabular form.

A note on treatment of swamps, stream beds, ponds, wells, pools, and other mosquito infested areas for the destruction of their larvae, H. C. WILSON (Madras: *Madras Fisheries Bur.*, 1914, pp. 14, pls. 8).—A note on mosquito control work in India.

Some new neotropical Simuliidae, F. KNAB (*Bul. Ent. Research*, 6 (1915), No. 3, pp. 279-282).—Three species, namely, *Simulium sanguineum* from Columbia, *S. limbatum* from British Guiana, and *S. placidum* from Trinidad, are described as new to science.

Flies: A factor in, a phase of, filariasis in the horse, F. E. PLACE (*Vet. Rec.*, 28 (1915), No. 1418, pp. 120-125).—The author attempts to trace a direct connection between the existence of certain flies, notably *Stomoxys calcitrans*, *Musca domestica*, and *M. vetustissima*, and the presence of certain flukes in the stomach of the horse.

Chemical reactions of fruit flies, F. M. HOWLETT (*Bul. Ent. Research*, 6 (1915), No. 3, pp. 297-305, pls. 4).—“There are certain smells remarkably attractive to male flies of the genus *Dacus* and by the employment of these smells the movements of the flies can to a great extent be controlled in any given direction. The reaction is strictly confined to the male sex, and different species exhibit a variation as regards the smell which is most attractive to them. It is uncertain whether the females emit similar smells; on the whole improbable.”

Effect of cold storage temperatures upon the pupae of the Mediterranean fruit fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 7, pp. 251-260, figs. 2).—In the investigations here reported the authors, assisted by H. F. Willard, conducted extensive experiments to determine the effect of the various ranges of temperatures used in commercial cold storage plants upon the pupae of the Mediterranean fruit fly. The work was carried on in connection with that relating to the effect of cold upon the eggs and larval instars, previously noted (*E. S. R.*, 34, p. 554).

In the introduction the authors call attention to the fact that while the greatest danger in the spread of this pest from one country to another lies in the transportation of the larvae within fruits, it is possible that the pest may also be transported in the pupal stage and arrive at its destination in a condition to produce infestation. It is stated that nearly all the experimental work with temperatures lower than 45° F. was carried on in a thoroughly modern cold storage plant.

The data presented, much of which are given in tabular form and include observations on 173,318 pupae, indicate that none survive refrigeration for longer periods than are necessary to cause the death of the eggs and larvae in host fruits held at corresponding temperatures. “About 50° is the critical point below which development can not take place and below which death will follow if refrigeration is continued sufficiently long. At 49 to 51° only 9 out of 39,500 pupae yielded adults in refrigeration 20 to 47 days after the inward date, while 3 out of 6 held at 52 to 56° yielded adults in refrigeration 38 to 52 days after the inward date. Many pupae can complete their entire development in refrigeration at 54 to 57°, while higher temperatures, not considered here, merely retard development without causing noticeable mortality.

“Pupae can not withstand temperatures below 50° for prolonged periods of time. Only 3 and 1 pupa survived refrigeration for 8 and 9 days, respectively, at 32°, while none of 4,500 pupae survived 10 days at this temperature. Refrigeration at a temperature averaging 34°, but ranging between 33 and 35°, proved fatal after the seventeenth day; 6,017 pupae refrigerated at this temperature for 18 and 25 days yielded no adults, while the number to yield adults after refrigeration for 14 and 17 days was very small. No pupae survived refrigeration at 28 to 40°, but averaging 36°, for more than 10 days. A temperature of 38 to 40° proved fatal after the nineteenth day; 30,731 pupae refrigerated for from 21 to 35 days failed to yield adults on removal to normal temperatures. After refrigeration at 40 to 45° pupae from each of two lar-

moved after refrigeration for 24 and 27 days, respectively, yielded adults; 20 pupa removed after refrigeration for from 31 to 34 days proved to be dead. "It does not seem safe to conclude that the age of the pupa has a direct bearing upon its ability to withstand the more ordinary ranges of cold-storage temperatures."

The bean maggot in 1915, D. B. WHELAN (*Michigan Sta. Circ. 28* (1916), p. 3, 4).—Serious damage was done by the bean or seed-corn maggot in Huron, Saginaw, Tuscola, Saginaw, Gratiot, Eaton, and Berrien counties in Michigan during 1915, previous to which year it had appeared in scattered numbers over quite a large area and the damage had been comparatively slight. Instances are reported of fields in which the loss of plants varied from 50 to 80 per cent. Examinations of a series of bean fields beginning on July 1 showed that the maggots had been present in the fresh manure, clover sod, and the rotting stems of clover, and had transferred their attention to the beans. The eggs are usually deposited on the stems of the plants just coming through the soil or on decaying vegetable matter.

It appears that cultural methods furnish the best means for combating this maggot. Land which is in clover or is covered with manure should be plowed early and prepared, so that the soil will be in good condition and the maggots given time to disappear before the beans are sowed. "Commercial fertilizers may be substituted for barnyard manure when the necessity for late fitting of the soil demands it, and repeated harrowing and perhaps rolling, especially when the ground is light in texture, seem to aid."

The adaptative forms of anthomyiid larvae; **Anthomyiidae**, the larvae of which are carnivorous, D. KELVIN (*Bul. Soc. Ent. France No. 20* (1914), pp. 496-501, figs. 3; *abs. in Ent. Mo. Mag.*, 3, ser., 1 (1915), No. 8, pp. 242, 243).—In continuation of investigations of dipterous larvae the author, in dealing with the Anthomyiidae, refers to larvae with saprophagous, phytophagous, parasitic, and carnivorous habits.

A catalogue of Coleoptera (*Coleopterorum Catalogus*. Berlin: W. Junk, 1913, pt. 56, pp. 223; 1914, pts. 57, pp. 289-408; 58, pp. 65; 59, pp. 215; 60, pp. 62; 61, pp. 16; 62, pp. 182; 1915, pts. 63, pp. 84; 64, pp. 14; 65, pp. 82).—In continuation of this work (E. S. R., 30, p. 458) part 56, by A. Grouvelle, catalogues the Byrridae and Nitidulidae; part 57, by M. Bernhauer and K. Schubert, the Staphylinidae, IV; part 58, by M. Pic, the Dascillidae, Helodidae, and Eucnemidae; part 59, by H. Clavareau, the subfamily Eumolpinae of the Chrysomelidae; part 60, by R. Jeannel, the subfamily Bathyscelinae of the Slipidae; part 61, by A. Méquignon, the Rhizophagidae; part 62, by F. Spaeth, the subfamily Cassidinae of the Chrysomelidae; part 63, by E. Csiki, the Mordellidae; part 64, by S. Schenkling, the Derodontidae, Lymexyliidae, and Micromalthidae; and part 65, by S. Schenkling, the Oedemeridae.

White grubs in Iowa, R. L. WEBSTER (*Iowa Sta. Circ. 29* (1916), pp. 4, fig. 3).—This circular calls attention to the importance of white grubs in Iowa and discusses control measures.

An insect pest of lucern, C. FRENCH, JR. (*Jour. Dept. Agr. Victoria*, 18 (1915), No. 3, pp. 567-569, figs. 3).—The cockchafer *Heteronyx picus* has been found to be a source of injury to alfalfa at Werribee, Victoria, considerable loss resulting.

Bud weevils and other bud-feeding insects of Washington, M. A. YOTTER (*Washington Sta. Bul. 124* (1916), pp. 5-43, pls. 6, figs. 3).—This paper reports observations made of the biology and control of weevils and other beetles which have been injuring the fruit buds of one- and two-year-old fruit trees in Washington State. It appears that several of the weevils are native feeders on the

sagebrush (*Artemesia tridentata*), the principal host plant in the districts where they are found, the injury being brought about through the clearing up of such lands and setting them to fruit trees, which then become the only available food plant.

The injury caused by the various species is said to have been considerable; at times every bud is eaten out and the trees die or do not get a start after they are planted. At other times only a few of the buds are destroyed and the trees are able to maintain themselves. In some orchards it was found that as many as half of the young trees were killed. Although this was an unusually high percentage, it is not uncommon to find new plantings with losses of 20 per cent.

The studies in 1911 were made at four localities and during 1912 at as many as 15. A list is given of 14 weevils and 5 other beetles studied, together with tables showing the different plants upon which the various species occur, the remedies tried, and the results obtained.

In regard to methods of control it is stated that as the weevils are wingless and can not fly they can be prevented from destroying the buds by the use of paper-cone tree protectors, here described, which are the most effective and practical means of protecting the trees against the weevils. The paper cones are also effective against climbing cutworms. With a little care and attention to the adjustment of the cones they will give protection throughout the first season, which is usually as long as necessary, as the weevils do not often injure older trees.

The weevils noted are *Cercopaeus artemisiae*, *Cleonus lobigerinus*, *C. quadrilineatus*, *Geoderces melanothrix*, *Melamomphus luteus*, *M. nigrescens*, *Mimetus setulosus*, *Mylacus saccatus*, *Panscopus aequalis*, *P. sulcirostris*, *Sitona apacheana*, *Tosastes cincrascens*, *Tricolepis* sp., and *Tychius lineellus*. The other beetles noted are *Cotalpa granicollis*, *Eusattus muricatus*, *Glyptoscelis alternata*, *Polyphylla decemlineata*, and *Syneta albida*.

From an economic standpoint *T. cincrascens* is the most important of the weevils discussed in this paper, being the cause of thousands of dollars of losses to orchardists throughout the whole of the arid region in the State. *M. setulosus*, the most abundant weevil, is the second most injurious of the bud weevils here discussed, having a wider distribution and a larger number of host plants than any of the other species. *E. muricatus* has been observed to travel readily up the trees and from bud to bud and can soon destroy all the buds on a tree. On older trees it feeds on the blossoms as well as the buds and young leaves and has been known to destroy the blossoms in some orchards to such an extent as practically to ruin the crop.

The strawberry weevil (*Anthonomus signatus*), T. J. HEADLEE (*New Jersey Stas. Circ. 56 (1916), pp. 8-8, fig. 1*).—Measures hitherto recommended for the control of the strawberry weevil having proved unsatisfactory, except in a limited way, the author was led to conduct the insecticide experiments here briefly reported, assisted by E. Douglass. While they were conducted in only one field with but a single variety of strawberry (Heritage), the results indicate what may be accomplished.

It was found that combinations of arsenate of lead and sulphur maintained as a dust coating throughout the two weeks when the strawberry is subject to the serious attack will afford almost perfect protection. While the half-and-half mixture of lead and sulphur is the most efficient, a mixture composed of one part of arsenate of lead to five parts of sulphur is effective and much cheaper. Two applications were in this case sufficient, the first being applied just as the beetles began to damage the buds and the second as soon there

after as the first treatment had disappeared from the upper surface of the foliage. The mixtures are readily applied with a powder gun and should coat thoroughly all parts of the plants, especially the buds. For the 1:5 mixture the cost should not exceed \$8 and for the 1:1, \$16 an acre, and in practical work this charge will probably prove to be materially less.

Some injurious Indian weevils (Curculionidae), G. A. K. MARSHALL (Bul. Ent. Research, 5 (1915), No. 4, pp. 377-389, figs. 4; 6 (1916), No. 4, pp. 365-373, figs. 5).—The species described in the first paper as new to science are *Phyto-scapus disimilis*, found feeding on young tea shoots, and *Corigetus bidentulus*, a serious pest of tea, in Assam; and *Rhynchenus (Orcheses) mangiferae*, the larvae of which bore in the leaves of the mango tree, and *Pachytichius munganis*, a weeviella (*Phaseolus mungo*) pest, in Madras.

The new species described in the second part are *Emperorrhinus defoliator* n. sp. and n. sp., found to defoliate the alder tree (*Alnus nitida*) and fruit trees; *Coniatus indicus* n. sp., which attacks tamarisk (*Tamarix indica*); *Caetharhynechus portulaca* n. sp., the larvae of which mine the leaves of purslane (*Portulaca oleracea*) cultivated as a vegetable; *Baris portulaca* n. sp., found boring in the stems of purslane; *Athesapeuta oryzæ* n. sp., a serious pest of rice; and *Acythopeus citrulli* n. sp., a pest of watermelons.

[Mouth parts of the honeybee], E. R. Root (Jour. Heredity, 7 (1916), No. 1, pp. 46, fig. 1).—Examinations of a colony of bees that worked in red clover in full bloom showed that the tongues of this particular colony measured 0.23 and 0.24 in., whereas the tongues of normal bees measured only 0.16 and 0.17 in.

Natural swarming of bees and how to prevent it, M. PERTIT (Ontario Dept. Agr. Bul. 233 (1915), pp. 15, figs. 8).—Practical information for the beekeeper. A monograph of the Formicidae of South Africa (Ponerinae, Dorylinae), L. ARNOLD (Ann. So. African Mus., 14 (1915), pt. 1, pp. 1-59, pl. 1, figs. 8).—Two of the five subfamilies of Formicidae are here dealt with.

It is pointed out that in South Africa the Ponerinae comprise about 20 per cent of the known ant fauna, and that since at least 80 per cent of their food consists of termites they constitute one of the chief checks to these pests in the Tropics. It is thought probable that all, or at least the majority, of the species of the subfamily Dorylinae are carnivorous, although one species (*Dorylus orientalis*) has been shown to feed also upon tubers and the bark of trees. Another species (*D. fulvus rhodesia*) has apparently been found to attend membracid larvae feeding on the roots of maize.

The acrobat ant, H. A. BAILLON (Agr. News [Barbados], 14 (1915), No. 351, p. 330).—An account of *Cremastogaster* sp., which is abundant in different parts of Grenada and may become troublesome in cacao fields in that island.

The control of ants which take away onion seed (Agr. News [Barbados], 14 (1915), No. 351, p. 378).—A brief report of experiments conducted with a view to preventing ants from removing onion seeds when planted and from biting holes in the young shoots as occurs in St. Vincent. In experiments conducted the most satisfactory results were obtained through attracting the ants to various baits and then killing them.

Two new species of *Arrhenophagus* with remarks, A. A. GIRALD (Jour. T. Ent. Soc., 23 (1915), No. 4, pp. 241, 242).

Notes on two South American parasitic Hymenoptera, A. A. GIRALD (Entomologist, 48 (1915), No. 628, pp. 213, 214).—*Baculus auraticeps* n. sp. is recorded as having been reared in numbers from the egg sac of a spider at Anna Regina, British Guiana.

Three new British chalcidoid Hymenoptera, with notes, A. A. GIRALD (Entomologist, 48 (1915), No. 628, pp. 217, 218).—*Aphidencyrtus aspidioti* brit-

tanicus n. sp. and *Apterotrix longiclava* n. sp. were reared from the oyster shell scale at Manchester, England.

Ticks of the Belgian Kongo and the diseases they convey, G. H. F. NUTTALL and C. WARBURTON (*Bul. Ent. Research*, 6 (1916), No. 4, pp. 313-352, figs. 48).—This paper, prepared at the request of the Belgian authorities, includes a brief résumé of the classification of ticks, with a short illustrated account of the species occurring in the Kongo, discussions of the general biology of ticks and the special biology of those occurring in the Kongo and their relation to disease, instructions for rearing ticks, etc.

The life cycle of *Trypanosoma brucei* in the rat and in rat plasma, R. ERDMANN (*Proc. Nat. Acad. Sci.*, 1 (1915), No. 10, pp. 504-512, figs. 7).—The author's investigations have resulted in the discovery of dimorphic forms, latent or round forms, and crithidia-like forms in *T. brucei* outside of the invertebrate host.

FOODS—HUMAN NUTRITION.

A sanitary study of condensed milk, W. H. PARK, M. C. SCHROEDER, and P. BARTHLOW (*N. Y. Med. Jour.*, 102 (1915), No. 22, pp. 1073-1083, figs. 10).—The investigation herein reported concerns the bacterial content of the milk used in preparing condensed milk; the process used in condensing milk with reference to its effect on the bacteria; and a bacteriological and chemical examination of the finished product.

Evaporated milk contained fewer bacteria than condensed milk, probably owing to the higher temperature used in its manufacture. Sweetened condensed milk showed the following variations in composition: Cane sugar, from 33.15 to 49.85 per cent; milk sugar, 7.57 to 15.34 per cent; and protein, 6.73 to 13.59 per cent.

The data of the experiments and clinical observations are summarized in part as follows:

"The value of sweetened condensed milk depends upon the care and cleanliness used in manufacture.

"There is a want of evidence that the bacteria or chemical constituents are capable of affecting the health. Only the use of the best quality of sweetened condensed milk is to be commended in the feeding of infants.

"Sweetened condensed milk, when carefully prepared from whole milk, has special indications as an infant food. They may be thus expressed: Many infants are unable to digest the fat of cow's milk, even when two or three volumes of water are added. In such cases the half digested curds of casein are vomited. The change in these circumstances to sweetened condensed milk allays the vomiting. These facts are well established clinically.

"Sweetened condensed milk has generally a constipating effect."

The opposite view that it produces diarrhea seems to be wanting in evidence.

"Clinical evidence . . . [indicates] that the intestinal irritation caused by milk is an effect of the action of the liquid portion, when freed of fat, sugar, and protein."

The water content of meat products, E. FEDER (*Chem. Ztg.*, 40 (1916), No. 21, pp. 157-160).—A controversial article (E. S. R., 34, p. 365).

Annual report of the Commissioner of Fisheries to the Secretary of Commerce for the fiscal year ended June 30, 1915, H. M. SMITH (*U. S. Dept. Com. Bur. Fisheries Doc.* 827 (1915), pp. 83).—This report contains general information and data regarding the quantities and values of food fish products landed at various places.

Ptomaine poisoning from "creamed" codfish, M. A. BLANKENHORN, G. E. HARMON, and P. J. HANZLIK (*Cleveland Med. Jour.*, 15 (1916), No. 2, pp. 97-104; *abs. in Jour. Amer. Med. Assoc.*, 66 (1916), No. 15, p. 1168).—A number of cases of so-called ptomaine poisoning, attributed to the eating of creamed salted codfish, are reported.

Bacteriological examination of the creamed fish showed the presence of *Bacillus coli communis* and other saprophytes and some staphylococci, but the authors do not attribute the symptoms to infection by the organisms in the fish material. The same physiological reactions were given by extracts of the creamed fish and of the same brand of salted codfish which was allowed to putrefy and was then prepared in the same manner as the food which the patients had been eating. The purified active extract of the creamed putrefied codfish contained a physiologically active base, whose chemical reactions resembled those of the group of diamins to which putrescine, cadaverine, and histamine belong.

Suitability of different kinds of wheat for bread making, O. RAMMSTEDT (*Ztschr. Öffentl. Chem.*, 21 (1915), Nos. 20, pp. 306-312; 21, pp. 321-329; 22, pp. 337-345).—Analytical data and baking tests are herein reported from which the author concludes in part as follows:

Small amounts of albumin and globulin are necessary in flour to give good results in baking, but too much or too little of these constituents acts unfavorably. The ratio of gliadin to glutenin influences the volume of the loaf, and the higher the total phosphoric acid content the greater the loaf volume. The water-soluble extractives also determine baking quality, and there seems to be a relationship between the carbohydrates soluble in water and the volume of the loaf.

A modified war bread, ROSSMANN (*Chem. Ztg.*, 40 (1916), No. 18, p. 135).—The composition of this substance (called N-bread) is as follows: Water 44.31, flour 1.31, fat 0.2, crude fiber 0.03, protein 5.87, and nitrogen-free extract 48.28 per cent. The bread is made by mixing 217 gm. of rye or wheat flour with 56 gm. of potato flour and adding to this 200 cc. of water containing 7 gm. of nutritive yeast, 8 gm. of table salt, and from 4 to 5 gm. of yeast as a rising agent. The product contains more protein than previously noted war breads and is recommended by the author for general use even after the war.

Fruit preservation and inspection, T. ZSCHOKKE (*Landw. Jahrb. Schäzeiz.*, 9 (1915), No. 5, pp. 588-590).—As a part of the report on fruit investigations are included the results of experiments on preserving plums and cucumbers, fruit inspection, the testing of fruit kilns, etc.

Factors which influence the quality of tea, J. J. B. DEUSS (*Dept. Landb. Wg. en Handel [Dutch East Indies], Meded. Proefstat. Thee.*, No. 42 (1915), pp. 6, pl. 1).—This bulletin contains data regarding the judgment of tea, such factors as the caffeine content, the ash content, the quantities of essential oils, and the amount of stems present in the tea being considered. Some of the material has been noted from another source (E. S. R., 34, p. 166).

The dairy and pure food laws of the State of Connecticut ([Hartford, Conn.]: *Off. Dairy and Food Comr.*, [1916], pp. 52).—The text of the laws is given as amended to the close of the legislative session of 1915.

Twenty-second annual report of the dairy and food commissioner of the state of Michigan for the year ending June 30, 1915, J. W. HELME (*Ann. Off. Dairy and Food Comr. Mich.*, 22 (1915), pp. 405, pls. 11).—The various activities of the department during the year ended July 1, 1915, are recorded. The report of the state analyst, F. L. Shannon, contains the results of the examination of 2,195 samples of miscellaneous foods and beverages, of which

445 were found to be adulterated, misbranded, or illegally sold, and also the analysis of 278 samples of feeding stuffs. The report of the drug analysis, A. R. Todd, presents the results of the examination of 558 samples of drugs, of which 134 were found to be adulterated. The work of the division of weights and measures is reported in detail. The publication also contains general information relating to pure-food topics and gives results of the inspection of dairies, creameries, cheese factories, city-milk depots, etc. A statement of prosecutions made during the fiscal year, the results of court proceedings brought, and reprints of the state food and drug laws and court decisions relative thereto are included.

Fifteenth biennial report of the Minnesota State Dairy and Food Commissioner, J. G. WINKLER (*Bienn. Rpt. Minn. State Dairy and Food Comr.*, 15 (1913-14), pp. 89, figs. 10).—The work of the commission for the biennial period ended July 31, 1914, is reviewed. The report of the state chemist, J. Hertig, gives the results of the analysis of 4,181 samples of miscellaneous foods, beverages, paints, oils, etc., of which 1,885 were found to be illegal.

The lunch room, P. RICHARDS (*Chicago: The Hotel Monthly*, 1916, 2. ed., rev. and enl., pp. 239, pl. 1, figs. 117).—This publication contains information on plans, equipment, management, accounting, food and drink sales, and bills of fare, and gives recipes.

Feeding of prisoners of war in Germany, FRIEDRICH (*Jour. Roy. Army Med. Corps*, 24 (1915), No. 4, pp. 387-394).—This article is a translation of an official German order for feeding prisoners of war. Classified information is given regarding the management of camps and the regulation of supplies, including standardized menus for feeding the men.

The biochemical analysis of nutrition, C. L. ALSBERG (*Jour. Wash. Acad. Sci.*, 6 (1916), No. 10, pp. 269-280).—This lecture discusses some of the recent contributions to the knowledge of the component parts of the food elements and their fate in metabolism, especially the investigations of the rôle of the amino acids in nutrition.

Experiments on the effects of a limited diet, VII-IX, S. BAGLIONI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 24 (1915), I, No. II, pp. 1158-1163; II, Nos. 4, pp. 213-220; 5, pp. 254-250).—Three papers are included, continuing previous work (E. S. R., 31, p. 264).

Reporting studies of the comparative nutritive value of wheat flour, corn flour, and egg powder, feeding experiments with laboratory animals (white rats) are described, in which a standard basal ration was supplemented in turn by egg powder, wheat flour, and corn flour. The rats receiving egg powder exhibited a marked increase in body weight, while those receiving wheat or corn flour failed to show similar development.

The author concludes that the nutritive value of the protein in corn and wheat is inferior to that of the protein in egg powder. It is noted, however, that the nutritive value of zein or gliadin alone is less than that of the whole grain protein.

In studies of the modifications of the metabolism of guinea pigs by exclusive feeding of corn, wheat, or green plants, feeding experiments with guinea pigs which received an exclusive diet of these substances, with the addition of water, are reported. In most cases the animals died, though some survived on the ration of green plants and water. The results indicate, in the author's opinion, that the animals died of acidosis produced by a lack of basic salts in the ration.

The rectal and intravenous utilization of grape sugar, G. BERGMAN (*Skand. Arch. Physiol.*, 32 (1915), No. 4-6, pp. 355-404, figs. 36).—Experiments

data are reported which show that dextrose may be utilized either by rectal or intravenous injection. The excretion of acetone bodies was in some cases appreciably diminished by this treatment.

The rectal and intravenous utilization of grape sugar, F. REACH (*Skand. Arch. Physiol.*, 39 (1915), No. 1-3, pp. 81-84, fig. 1).—A comment on the above reference.

The limit of assimilation of glucose, A. E. TAYLOR and FLORENCE HULTON (*Jour. Biol. Chem.*, 25 (1916), No. 1, pp. 173-175).—The authors report feeding experiments with normal men who received varying amounts of glucose (from 200 to 500 gm.) from 2½ to 3 hours after a light breakfast. Analyses of the blood and urine were made to indicate the extent of the utilization.

"Apparently there is in the majority of healthy adult males no limit of assimilation of glucose; glucosuria does not occur following the largest possible ingestions of pure glucose."

The influence of salicylate on metabolism in man, W. DENIS and J. H. MEANS (*Jour. Pharmacol. and Expt. Ther.*, 8 (1916), No. 6, pp. 273-283).—Experimental data are reported concerning the nitrogenous and respiratory metabolism of normal men as affected by the ingestion of sodium salicylate. The results indicate an increased excretion of nitrogen, phosphates, and uric acid, but no change in the respiratory quotient.

Beri-beri in Lebong.—An account of the steps taken to eradicate the disease during 1914, J. C. KENNEDY (*Jour. Roy. Army Med. Corps*, 25 (1915), No. 3, pp. 268-285, figs. 2).—A clinical report of an epidemic among English soldiers, which proved to be beri-beri. The disease was eradicated by providing an adequate diet and by improving the general health of the soldiers by means of hygienic surroundings and physical exercise.

Clinical calorimetry, VI-XVII (*Arch. Int. Med.*, 15 (1915), No. 5, pp. 882-94, figs. 9; 17 (1916), No. 6, pp. 855-1059, figs. 18).—A continuation of previous work (E. S. R., 34, p. 68).

VI. Notes on the absorption of fat and protein in typhoid fever, W. Coleman and F. C. Gephart (pp. 882-886).—Analytical data are reported showing the metabolism of protein and fat for seven typhoid patients on the high-calorie diet.

VII. Calorimetric observations on the metabolism of typhoid patients with and without food, W. Coleman and E. F. Dubois (pp. 887-938).—The calorimetric data herein reported were obtained by the use of the respiration calorimeter in Bellevue Hospital.

VIII. On the diabetic respiratory quotient, G. Lusk (pp. 939-944).—The information presented in this paper is of value in explaining metabolism in diabetes. Particular weight is attached to the relationship between the ingestion of protein and the respiratory quotient. Both normal and diabetic respiratory quotients are given for the individual amino acids.

IX. Further measurements of the surface area of adults and children, Margaret Sawyer, R. H. Stone, and E. F. Dubois (pp. 855-862).—Measurements of surface are reported, the results of which are summarized as follows:

"The so-called 'linear formula' (E. S. R., 34, p. 68) for the estimation of the surface area has been satisfactorily tested on four new subjects of varying size and shape. In addition partial measurements of two legless men have been made. The average error in the formula when applied to the four subjects was 1.3 per cent. Two of the subjects were children and in these cases the error in the formula was under 3 per cent. Since the youngest was about two years old, it does not seem advisable to use the formula for babies under this age until the factors have been tested by the measurements of infants."

X. A formula to estimate the approximate surface area if height and weight be known, D. and E. F. Dubois (pp. 863-871).—"The method of calculating the surface area from the so-called 'linear formula' is given with a slight correction in the factor for the arms and an alternative measurement for the thighs. A simpler 'height-weight formula' has been devised to estimate the surface of subjects if only their height and weight be known. This is expressed in the terms $A = W^{0.42} \times H^{0.72} \times C$, A being the surface area in square centimeters, H the height in centimeters, W the weight in kilograms, and C the constant 71.84. A chart has been plotted from this formula so that the approximate surface area may be determined at a glance."

"The errors in the various formulas [are estimated] as follows: 'linear formula' and 'height-weight formula' maximum \pm 5 per cent, average \pm 1.5 per cent, Meeh's formula [$A = W^{1/2} \times C$], maximum $+ 30$ per cent, average $+ 15$ per cent. In general the maximum figures apply only to those of unusual shape, while with those of average body form the average error will seldom be exceeded."

XI. A comparison of the metabolism of men flat in bed and sitting in a steamer chair, G. F. Soderstrom, A. L. Meyer, and E. F. Dubois (pp. 872-888).—Experimental data are summarized by the authors as follows:

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"The difference between the results is so small that in the study of pathologic cases . . . the same figures [can be used] for the average normal metabolism in both postures. In the majority of cases, however, the energy requirement is lower in the orthopneic position."

XII. The metabolism of boys 12 and 13 years old compared with the metabolism at other ages, E. F. Dubois (pp. 887-901).—"Eight normal boys, 12 or 13 years old, were studied in the respiration calorimeter four to six hours after a small breakfast. They were allowed to read for one of the two experimental hours, but were very quiet. The methods of direct and indirect calorimetry agreed within 0.04 per cent. Their heat production per unit of surface area was 22 per cent higher than the adult level according to Meeh's formula, or 25 per cent higher according to the more accurate 'linear formula.'

"In studying the effect of growth on metabolism, interpretation of the results obtained on infants is complicated by the fact that babies differ greatly from adults in the proportions of the body and the relative size of the viscera, notably the liver and thyroid. Boys just before the onset of puberty have almost adult proportions. They are in the midst of a period of accelerated growth. The fact that the metabolism is high points to a specific increase in the metabolism of the growing organism."

XIII. The basal metabolism of normal adults with special reference to surface area, F. C. Gephart and E. F. Dubois (pp. 902-914).—"The basal metabolism of four normal men and one woman has been determined, and experiments have been made on the specific action of protein and glucose.

"A study of the new controls, together with those reported in the literature since . . . [the] last publication [E. S. R., 34, p. 68], supports the views previously expressed. There is no reason to change the statement made in . . . [the] previous paper, that if a given subject's basal metabolism is more than 10 per cent from the average, it may be regarded as abnormal, but can not be proved abnormal unless the departure from the average is at least 15 per cent. The average basal metabolism of normal men is 34.7 calories per square meter per hour as determined by Meeh's formula. On account of the average plus error of about 15 per cent in Meeh's formula the average figure is 39.7 calories, or in round numbers 40 calories, when the more exact 'linear formula' or the new 'height-weight formula' is used to determine surface area.

"The average metabolism of fat and thin subjects is the same according to surface area when the surface area is correctly measured. The metabolism of women averages 37 calories, or 6.8 per cent lower than that of men. A group of men and women between the ages of 40 and 50 gave figures 4.3 per cent below, and a group 50 to 60 years old 11.3 per cent below the average for the larger group between the ages of 20 and 50.

"Under the atmospheric conditions of the calorimeter experiments the average water elimination by normal men through skin and lungs is 28.4 gm. an hour. About 24 per cent of the heat produced is dissipated in the vaporization of water.

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XV. *The basal metabolism in pernicious anemia*, A. L. Meyer and E. F. Dubois (pp. 965-979).—A report of calorimetric observations of basal metabolism in six cases of anemia.

XVI. *The basal metabolism of patients with cardiac and renal disease*, F. W. Shobdy, A. L. Meyer, and E. F. Dubois (pp. 980-1009).—Clinical observations of calorimeter experiments are reported.

XVII. *Metabolism and treatment in diabetes*, F. M. Allen and E. F. Dubois (pp. 1010-1059).—The data of clinical observations and respiration calorimeter experiments during the treatment of six cases of diabetes are reported in full.

The basal energy requirement of man, E. F. Dubois (*Jour. Wash. Acad. Sci.*, 1916, No. 11, pp. 347-357, fig. 1).—In this lecture the author considers the definition of the term basal energy requirement, the manner in which metabolism is studied, and the factors by which it is influenced in health and disease. Although muscular work affects metabolism to a greater extent than all other factors combined, attention is called to the very important part that diet plays in such diseases as typhoid fever, exophthalmic goiter, and diabetes.

ANIMAL PRODUCTION.

Vigor and heredity, J. L. BONHOT (London: West, Newman & Co., 1915, pp. XII+263, pls. 11, figs. 4).—This book treats of the inadequacy of present theories of heredity, prepotency, inbreeding, coloration as an index of vigor, and other related subjects.

The formation of protein in the animal body from the nonprotein substances, A. STUTZER (*Fühling's Landw. Ztg.*, 64 (1915), No. 11-12, pp. 281-56403°-16—6

X. A formula to estimate the approximate surface area if height and weight be known, D. and E. F. Dubois (pp. 863-871).—"The method of calculating the surface area from the so-called 'linear formula' is given with a slight correction in the factor for the arms and an alternative measurement for the thighs. A simpler 'height-weight formula' has been devised to estimate the surface of subjects if only their height and weight be known. This is expressed in the terms $A = W^{0.4} \times H^{0.7} \times C$, A being the surface area in square centimeters, H the height in centimeters, W the weight in kilograms, and C the constant 71.8. A chart has been plotted from this formula so that the approximate surface area may be determined at a glance."

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The formation of protein in the animal body from the nonprotein substances, A. STUTZER (*Fühling's Landw. Ztg.*, 64 (1915), No. 11-12, pp. 281-

295).—The author summarizes the results of previous investigators in feeding ammonium salts, urea, asparagin, and other protein-rich substances, to carnivora, herbivora, and omnivora.

A list of cited literature is included.

Studies in the blood relationship of animals as displayed in the compositions of the serum proteins.—V, The percentage of nonproteins in the sera of certain animals and birds, R. M. JEWERT (*Jour. Biol. Chem.*, 25 (1916), No. 1, pp. 21, 22).—In former articles of this series (E. S. R., 32, p. 861) it was assumed that the amount of nonproteins in the blood sera of all animals was about the same, but it has since been ascertained that this assumption is not accurate. The present work was undertaken to ascertain the amount of nonprotein in the blood of each kind of animal formerly studied and to correct the figures which are affected by the revised estimation of the nonproteins.

A table is given showing the refractive indexes obtained, the percentages of albumin, globulin, and total protein determined by previous investigators, and the figures as corrected by the present investigation, for the horse, ox, rat, hog, sheep, goat, cat, dog, guinea pig, hen, and duck.

The valuation of feeding stuffs. E. LAUR (*Fühlung's Landw. Ztg.*, 64 (1915), No. 15-16, pp. 377-407; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 12, pp. 1694-1697).—On the basis of the researches of Pfeiffer, Neubauer, and Mach on the estimation of the cash value of feeding stuffs, the German Federation of Agricultural Experiment Stations adopted in September, 1913, certain resolutions. The author subjects all these conclusions to criticism and endeavors to establish the principles for a just valuation of feeding stuffs.

Comparative feeding value of green grass and hay (*Mark Lane Express*, 114 (1915), No. 4375, p. 145).—Experiments were conducted on the comparative feeding value of fresh grass and hay, the latter made in the ordinary way and also dried in hot-air chambers.

The effect of these fodders on milk yield was tested with three ewes and a goat, and the digestibility with the same three ewes later in the summer. The milk yield showed no constant difference in quantity or in composition between the green and dried grass, but the digestibility of fresh grass was constantly, though slightly, greater.

It is pointed out that the process of drying has a distinct influence on the nutritive value. In ordinary haymaking there is considerable loss from oxidation. This may be avoided by a rapid drying in which the initial temperature is high but does not exceed 100° C. The changes in digestibility seem to be due rather to changes of a physical nature than to chemical decomposition. They are sometimes so small as hardly to alter the proportion of starch.

The feeding of grain sorghums to live stock. G. A. SCOTT (*U. S. Dept. Agr. Farmers' Bul.* 724 (1916), pp. 14, figs. 5).—This treats of the composition and feeding value of the various grain sorghums, including analyses, and data as to methods of feeding and the value of the sorghums as forage, together with a number of suggested rations for various kinds of live stock.

In tests conducted by the Department on Texas farms grain sorghums were fed to beef cattle. The results obtained indicate the efficiency of the grain-sorghum feeds in the form of chop, head chop, silage, fodder, or stover, both in wintering cattle and in finishing them for the market. Silage of the grain sorghums was found to be very beneficial for increasing the appetites of feeders, keeping them in fine condition, and adding a high finish.

The following table summarizes the results of the work:

Results of use of grain sorghums in feeding tests on Texas farms.

Age of cattle.	Number fed.	Period of feeding.	Daily ration per head on full feed.	Average daily gain per head.
2 years	127	Oct. 28 to Feb. 2	Cotton-seed meal ^a ; Kafir-corn chopped silage	2.39
2 years	200	Jan. 1 to May 1	Sorghum fodder ^a ; cotton-seed meal, 6 pounds; Kafir-corn chops, 8 pounds; silage 40 pounds	1.84
3 years	32		Cotton-seed meal, 4 pounds; milo-maize ch o p s, 18 pounds; silage, 40 pounds; sorghum butts	1.75
3 years	68	Jan. 17 to July 3	Cotton-seed meal, 6 pounds; silage, 60 pounds; bundled Kafir-corn, 6 pounds	1.75
9 months	90	Nov. 1 to Feb. 12	Cotton-seed meal 4.5 pounds; silage, 30 pounds; wheat straw ^b	2.08
Yearlings		Dec. 1 to April 16	Cotton-seed meal, 3 pounds; Kafir-corn chops, 5 pounds; silage, 20 pounds; straw ^b	1.76
Do.	63	Oct. 31 to June 4	Cotton-seed meal, 2.5 pounds; milo-maize ch o p s, 10 pounds; silage 20 pounds; wheat straw ^b	1.65
Heifer calves	116	Oct. 31 to May 1	Cotton-seed meal, 2 pounds; milo-maize ch o p s, 5 pounds; silage, 25 pounds; wheat straw ^b	1.38
Do.	126	Winter	Cotton-seed meal, 1.5 pounds; milo-maize ch o p s, 5 pounds; silage, 25 pounds; straw ^b	1.38
Calves		December-March, wintered only	Cotton-seed meal ^a ; silage ^b ; straw ^b	1.42

^aAmounts not given.

^bWere given all they would eat.

The influence of the lactic acid bacteria on protein, A. STUTZER (*Biochem. Itshir*, 79 (1915), No. 3-4, pp. 299-305).—It has been found that the best fermentation in silos is obtained by using lactic acid bacteria, preferably those owing at a low temperature, as *Bacillus cucumeris fermentati*. In tests made by the author hay was subjected, with and without the addition of sugar, to the action of these bacteria, but the experiment showed that these bacteria are incapable of decomposing the protein present in hay. Experiments conducted to determine whether *B. cucumeris fermentati* has the power of forming protein synthetically by means of asparagin, urea, or ammonium acetate indicated that this is not possible.

The feeding value of apple pomace, J. B. LINDSEY (*Massachusetts Sta. Circ.* 58 (1915), pp. 4).—A revision of Circular 47, previously noted (E. S. R., 32, p. 33).

Bed residues for farm stock, J. B. LINDSEY (*Massachusetts Sta. Circ.* 62 (1916), pp. 7).—A revision of Circular 48, previously noted (E. S. R., 33, p. 27).

Analysis of feeding stuffs, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul.* 178 (1916), pp. 16).—Analyses are given of the following feeding stuffs: Wheat bran, wheat middlings, shredded wheat waste, red dog flour, wheat middlings, cotton-seed meal, hominy feed, hominy meal, alfalfa meal, dried beet pulp, brewers' dried grains, distillers' dried grains, cracked bone, bone

meal, meat scrap, fish scrap, gluten feed, linseed oil meal, provender, oat hulls, and various mixed and proprietary feeds.

Analyses of commercial feeding stuffs, P. H. WESSELS and F. O. FIRTS (*Rhode Island Sta. Insp. Bul.*, 1916, May, pp. 12).—Analyses are given of the following feeding stuffs: Fish scrap, meat scrap, cotton-seed meal, linseed meal, gluten feed, dried brewers' and distillers' grains, wheat middlings, bran, provender, hominy feed, ground oats, sugar-beet meal, oat hulls, dried beet pulp, and alfalfa meal, and various proprietary and mixed feeds.

Stock raising (*U. S. Dept. Int., Rpt. Comr. Indian Aff.*, 1915, pp. 28, 29).—A general account of the status of stock raising on the various Indian reservations. It is stated that Indian stock has been so successfully managed since the policy of increasing stock raising among the Indians was inaugurated some two years ago as to justify the undertaking fully. Inspections and reports show the tribal herds and individually owned cattle, horses, and sheep to be rapidly improving in breed, increasing in number, and showing a gratifying profit on the investment. It is predicted that the Indian-owned stock will soon become a substantial factor in the world's supply.

Cattle-feeding experiment, 1914-15, W. BAUCÉ (*Edinb. and East of Scot. Col. Agr. Rpt. Leaflet, Ser. C, No. 1* (1915), pp. 4).—In cattle-feeding experiments comparing the value of various rations (palm-nut cake, dried distillers' grains, chaffed hay and Bombay cotton cake, and Bombay cotton cake) the dried distillers' grains proved a cheaper feeding stuff than Bombay cotton cake. The results indicate that palm-nut cake (palm-kernel cake) is a useful feeding stuff and that apparently it is practically equal in value to the best class of dried distillers' grains, which it somewhat resembles in composition. It is stated that cattle do not eat this cake when it is first put before them, but that in a few days they take it quite readily, and that there appears to be no practical difficulty in feeding it to fattening steers when they are accustomed to it from the beginning of the fattening period.

Report on cattle-feeding experiments conducted at Crichton Farm, Dumfries, 1911-1915, W. G. R. PATERSON (*West of Scot. Agr. Col. Bul.* 67 (1915), pp. 42, pl. 1).—In three series of cattle-feeding experiments, comparing the value of decorticated and undecorticated cotton cakes, soy-bean cake, and linseed cake, decorticated cotton cake and soy-bean cake each proved superior to a mixture of linseed cake and undecorticated cotton cake, even when 1 lb. additional of the mixture was fed. The difference between decorticated cotton cake and soy-bean cake was not very great but the balance was in favor of the former. The return for every ton of oats, hay, straw, and turnips was very much greater when fed with decorticated cotton cake than when fed with a mixture of linseed cake and undecorticated cotton cake.

Palm-nut cake proved to be inferior to a mixture of decorticated cotton cake and crushed oats.

"Bulldog" cattle (*Jour. Heredity*, 7 (1916), No. 6, pp. 263-265, figs. 2).—An account of the Niata breed of cattle, described by Darwin. This breed is supposed to have arisen among the Indians of South America, but is now becoming extinct. The extraordinary jaw and face are thought to be due to mutation.

Mathematical selection of Swiss cattle (*Breeder's Gaz.*, 69 (1916), No. 12, p. 958, figs. 3).—A method of appraising cattle by means of a rational mathematical system has recently been adopted by the Swiss Government. The purpose of the method is to determine and express in decimals the correlations which exist between the conformation of the different parts of the body of the animal and its fitness. The instrument deemed most practical for this is the

measuring cane invented by A. Deriaz of Lausanne. This is composed of a simple rod, grooved and graduated, and provided with two perpendicular arms, one of which is fixed permanently at one end and the other can slide along the rod and be stopped at any desired point.

The measurements taken on the animal with this instrument are as follows: (1) Measurements of the length of the body, chest, loins, and quarters; (2) measurements of the height at the withers (from the ground to the highest point on the animal), of the knee (from the ground to the lower edge of the joint), of the loin, and of the tail-head; (3) measurements of the width, by means of the two arms of the instrument, of the hooks, pin bones, and thighs; and (4) measurements of the head, principally its length, its width between the base of the horns, and the width of face.

The Yunnan breed of sheep, A. HALLOT (*Bul. Econ. Indochine, n. ser.*, 18 (1915), No. 112, pp. 165-181; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Insect. and Plant Diseases*, 6 (1915), No. 11, pp. 1512-1514).—An account of the breed characteristics and utility value of the sheep of Yunnan, China.

The fleece is white, black or white with spots of fawn, red, or black. With the exception of a tuft of long hair hanging over the forehead, the fleece extends from the base of the neck to the knees and above the hocks. No wool occurs on the belly, but hair often occurs under the chest, extending toward the withers. With certain rare exceptions the wool is mixed with kemp in variable quantity. In the tallest animals the base of the fleece consists of long stiff hairs.

The wool fiber and certain phases of scouring and loose wool dyeing, L. J. MÁTOS (*Bul. Nat. Assoc. Wool Manfrs.*, 45 (1915), No. 2, pp. 146-171, figs. 10).—Methods of scouring and dyeing wool are described.

Fattening lambs, J. M. JONES (*Texas Sta. Bul.*, 186 (1916), pp. 8-15, figs. 4).—Two lots of about 250 47-lb. range-bred lambs were fed 119 days as follows: Lot 1, cotton-seed meal, cotton-seed hulls, and feterita and sorghum silage; lot 2, cotton-seed meal and feterita and sorghum silage. After 59 days of the test feterita and milo-maize chops were added to the ration of lot 2; and after 102 days the ration of lot 1 was supplemented by the same concentrate.

The results indicate that good silage can be fed to fattening lambs without injury to them. During the first 59 days the lambs in lot 2 consumed an average of 3.78 lbs. of silage per head daily and their average daily gain was 0.285 lb. per head.

"While silage seems to have a place in the ration of a fattening sheep it should not constitute the only roughage. Owing to the succulent nature of silage, it is quite impossible for lambs to consume enough of this feed to get the necessary amount of dry matter that is required by the animal body. Lambs receiving silage as the sole roughage are inclined to go 'off feed.' The lambs in lot 1 received cotton-seed hulls in addition to the silage, and throughout the entire feeding period all the lambs remained continually 'on feed.' No moldy silage was fed to the lambs and no losses directly attributed to the feeding of inferior silage resulted."

The lambs in lot 1 made a good economical gain during the early part of the feeding period, but after about 100 days they apparently became "burned out" the average daily gain per head during the final 17 days of the test being only 0.068 lb.

During the first 6 days after the feterita and milo maize had been supplied in the ration of lot 2 at the end of the first 59-day period, the average gain per head was increased from 0.24 to 0.42 lb. daily. After ground feterita and milo maize had been supplemented in the ration received by lot 2 the lambs did not go "off feed" as readily as when on the ration composed wholly of cotton-seed meal and silage.

The lambs of lot 1 returned a profit of \$1.03 per head, and those of lot 2, 82 cts. per head.

The influence of domestication on the mechanical qualities of the pars compacta of *Sus scrofa domestica*, together with a discussion of the theory of the functional adaptation of the skeleton, A. SCHIMMEL (*Arch. Entwickl. Mech. Organ.*, 41 (1915), Nos. 3, pp. 472-534, pls. 2, figs. 5; 4, pp. 605-671, figs. 8).—Data are given on the moduli of strength of the compact bone substance of wild and domestic swine.

In general, grazing animals show a higher modulus of elasticity and a greater firmness than those of the same age not on pasture. The specific gravity of the compacta of *S. scrofa domestica* undergoes various changes. In the metatarsal bones of the young and the tibial and metatarsal of older wild swine it is much higher than for domestic swine of the same age. The specific gravity of the compacta of *Sus* and *Cervus* is lower in the metatarsus than in the tibia.

A bibliography of references is included.

Physiology and bacon curing, K. J. J. MACKENZIE and F. H. A. MARSHALL (*Jour. Roy. Agr. Soc. England*, 76 (1915), pp. 1-13).—It is stated that the black pigment so often found in the mammary area of sows belonging to colored breeds is in no way related to sexual changes occurring during the period of heat or oestrus. On the other hand, it is closely similar to, or identical with, the pigment of the hair, and is consequently harmless. It follows that the heavy losses sustained by bacon manufacturers owing to the presence of this pigment have been incurred unnecessarily.

Experiments have shown that the results of ovariotomy are such as to justify the operation being carried out for commercial purposes, since spayed sows tend to feed better and fatten faster than open or unoperated ones. Those cases in which sows which were supposed to have been spayed have behaved as though they were open are the result of faulty operating.

The breeding and feeding of pigs for bacon factory purposes, R. C. SIMMONS (*Rhodesia Agr. Jour.*, 13 (1916), No. 2, pp. 187-214, pls. 2, figs. 3).—A general discussion of the type of pig required for bacon production, and of methods of feeding, care, and management, together with a number of suggested rations.

Feeding potatoes to fattening swine, W. VÖLTER (*Deut. Landw. Presse*, 2 (1915), No. 91, pp. 771-773, figs. 8).—It was demonstrated that it is not feasible to feed potatoes alone to growing and fattening swine, a protein supplement being essential to satisfactory development.

Feeding experiments with straw meal and cellulose material, SCHNEIDER-WIND (*Landw. Wochenschr. Sachsen*, 18 (1916), No. 7, pp. 57-59).—The addition of a cellulose feed, composed of 65 per cent of straw material, 20 per cent of dry potatoes, and 15 per cent of molasses, to the ordinary grain ration for swine proved to be a valuable supplement, materially increasing the gain over a grain ration alone.

Feeding pigs on the subcutaneous matter of hides intended for tanning, W. ELLENBERGER and W. GRIMMEL (*Berlin. Tierärztl. Wochenschr.*, 31 (1915) No. 32, pp. 373-378).—The authors conducted experiments in feeding the subcutaneous matter of hides to swine. This feed was well liked by the pigs and produced normal development. It was found to be an excellent concentrate feed, equal in nutritive value to a mixture of crushed beans and cereals. The digestibility of the protein was 21 per cent and the starch equivalent 76.4 per cent. The flesh of the swine was found to be normal in composition. The meat when cooked had an excellent flavor and in no case was any disagreeable taste detected, whether raw or cooked.

The composition of the subcutaneous matter is given as water 13.2 per cent, protein 55, fat 26.5, and ash 5.2.

Color in horses, J. W. THOMPSON (*Breeder's Gaz.*, 69 (1916), No. 19, pp. 1920, 1921).—The author presents data tending to show that English racing records demonstrate that bay is predominantly a color of speed and bottom.

Licensed stallions in Utah during the season of 1915, W. E. CARROLL (*Utah Sta. Circ.* 19 (1916), pp. 3-20).—Tables showing the distribution of licensed stallions by counties and breeds for the State of Utah are given.

Capsule method of breeding mares, W. E. CARROLL and H. J. FREDERICK (*Utah Sta. Circ.* 20 (1916), pp. 3-6, fig. 1).—This circular treats of the advantages and methods of capsule breeding of mares.

Better horses for Utah, W. E. CARROLL (*Utah Sta. Circ.* 18 (1916), pp. 3-10, fig. 1).—This circular treats of the number and prices of horses in the United States, the type of horse most in demand, the need of improvement, and the Utah stallion license law as a factor in the improvement of horses.

Some fertility experiments, B. F. KAUPP (*Poultry Item*, 18 (1915), No. 2, pp. 6, 7, 86-90, fig. 1).—Extensive data collected at the North Carolina Experiment Station indicate that under ordinary conditions a fertility of from 80 to 90 per cent should be obtained and that from 80 to 90 per cent of the fertile eggs should hatch. Fertility rapidly declines after the removal of the cocks. It is not advisable to save eggs for hatching after the male birds have been removed from the pen for five days. If the hens mated have been running with mongrel cocks all spermatozoa in the oviducts of the hens should be dead by the eighteenth day, thus making it safe to save the eggs after that time.

(Poultry husbandry) (*Minnesota Sta. Rpt.* 1915, pp. 41, 42).—It has been found that the labor cost per pound of raising chicks is greater before they are placed on range than afterward, but contrary to the opinion of some the feed cost per pound is greater with the larger chicks. Chicks artificially hatched and reared were fed at less cost than when reared by the natural process, that is, when the cost of feeding the mother hens was reckoned with the cost of feeding the chicks. With a plentiful supply of skin or sour milk the feed cost per pound of chicks five weeks old or less varied from a little over 4 cts. to a little over 6 cts.

Results of experiments indicate that a confined area for breeding flocks results in an excess of infertile eggs and chicks of less vitality. Several trials with eggs from flocks confined to small yards compared with those from flocks that had free range, at least half the time, showed more than twice the percentage of infertile eggs from the flocks in the small yards.

Teaching the young stock to roost, Mr. and Mrs. G. R. SHOUR (*Washington & West Wash. Sta. Mo. Bul.*, 4 (1916), No. 2, pp. 10-14, figs. 5).—The use of modified King ventilating system and a forced roost apparatus is described, and plans for their construction are given.

Report on experiments on the feeding of poultry and on the feeding of chickens and ducklings conducted during 1913-14, AGNES KINROSS (*West of Scot. Agr. Col. Bul.* 66 (1915), pp. 22).—Data are given on the cost of keeping poultry, the feeding of chickens from birth to a laying age, the feeding of table chickens from birth to a marketable age, and the feeding of table ducklings.

Buttermilk cheese versus meat meal in broiler duck raising, B. F. KAUPP (*Poultry Item*, 18 (1916), No. 7, pp. 8-10).—Three lots of ducks were fed the following rations: Lot 1, wheat bran, corn meal, and buttermilk cheese, 2:4:2; lot 2, wheat bran, corn meal, and beef scrap, 2:4:1; and lot 3, wheat bran, corn meal, and buttermilk cheese, 2:4:3.

The buttermilk cheese was made as follows: The fine-grained curd resulting from pasteurizing sour cream was brought into solution by a small quan-

tity of sodium hydroxid. The buttermilk was then curdled by acidifying with hydrochloric acid, and the vat of milk was heated to from 130 to 140° F. and held at this temperature for from 30 minutes to one hour. The curd was then drained, salted, and packed. The yield of finished cheese was about 12 per cent, and contained 20 per cent of protein.

At 10 weeks of age the average weight of lot 1 was 4.31 lbs. per head; of lot 2, 5.25 lbs., and of lot 3 4.62 lbs., so that the buttermilk cheese apparently did not take the place of the meat scrap. In the 10 weeks lot 1 consumed 31 lbs. of mash which cost \$8.78, and lot 2 101 lbs. of mash which cost \$2.31. The average weight of lot 3 at the end of 11 weeks was 5.41 lbs. During this time there was consumed 429 lbs. of mash which cost \$18.21.

The high cost of the buttermilk cheese was one cause of the high cost in lots 1 and 3. If the cheese could be produced on the farm from nonsalable buttermilk, that is, buttermilk for which there is no immediate market, the cost would be merely that of converting this animal protein into a salable product, as in chick feeding.

How to start a mink ranch, R. LEWIS (*Medical Lake, Wash.: Author [1915], pp. 6*).—This pamphlet deals with the principles of starting a fur farm for raising mink.

DAIRY FARMING—DAIRYING.

Manual of the dairy industry, E. DE VEVEY (*Lausanne: Soc. Lait. de la Suisse Romande, 1916, 2. ed., rev., pp. 340, pls. 5, figs. 110*).—This book treats of the production of milk, butter, and cheese for commercial purposes.

Balanced rations for dairy stock, J. B. LINDSEY (*Massachusetts Sta. Circ. 63 (1916), pp. 8*).—A revision of Circular 50, previously noted (E. S. R., 33, p. 275).

Studies on aerobic spore-bearing nonpathogenic bacteria, J. S. LAWRENCE and W. W. FORD (*Jour. Bact., 1 (1916), No. 3, pp. 273-319, pls. 26*).—This reports a morphological study made of the following spore-bearing bacteria in milk: *Bacillus cereus*, *B. subtilis*, *B. albolactus*, *B. vulgarus*, *B. mesentericus*, *B. butiformis*, *B. petasites*, *B. coharcens*, and *B. terminalis*.

Electrical treatment of milk for infant feeding and the destruction of *Bacillus tuberculosis*, J. M. BEATTIE and F. C. LEWIS (*Jour. State Med., 24 (1916), No. 6, pp. 174-177*).—In experiments with tuberculous milk it was found that electrical conditions which give at the outlet of the lethal tube a constant temperature of from 63 to 64° C. are satisfactory for the destruction of tubercle bacilli, even when these are present in such abnormal numbers as in the special sample on which the experiment was conducted.

It is concluded that the electrical method can be used successfully, but that there must be a strict adherence to certain definite conditions of measurement, rate of flow, current, density, etc.

Pasteurization in the dairy industry, O. F. HUNZIKER (*Cream. Jour., 2 (1916), No. 9, pp. 18, 19, 22, 29; Milk Dealer, 5 (1916), Nos. 9, pp. 4-8; 10, pp. 16-20; Cream. and Milk Plant Mo., 4 (1916), No. 10, pp. 11-17*).—This article deals with the commercial value of pasteurization, its germ-killing efficiency, and its effect upon flavor.

Standardizing cream (*Milk Dealer, 5 (1916), No. 9, p. 22*).—An accurate and simple method of standardizing cream, devised by the Dairy Division of the U. S. Department of Agriculture, is described.

Why the fat standard should be used, HEPBURN (*Cream. Jour., 27 (1916), No. 10, pp. 12, 13, 15*).—The author urges the substitution of the fat for the moisture standard in determining the market value of butter. It is stated

that a fat standard would standardize all manufacture, as far as composition is concerned, and put purchasing and selling on a similar basis. The fat standard would practically regulate other constituents in butter and, by resulting in a decrease of the percentage of salt, would operate in such a way as to furnish the consumer with a milder piece of goods. This, it is thought, would increase the consumption of butter, as more butter would be consumed if of mild flavor.

Methods for testing butter fat are given.

Butter profits and losses (*Wallaces' Farmer*, 41 (1916), No. 19, p. 732, *fig. 1*).—A chart is given showing the estimated profits and losses for the past ten years of the dairyman who makes butter or sells cream to the creamery. The butter profit and loss areas follow very closely the business profit and loss area as devised by the Babson Statistical Organization, as do also the accompanying profit and loss areas in hogs and cattle.

American cheese in England, J. G. FOSTER, E. E. YOUNG, and W. H. BRADLEY (*U. S. Dept. Com., Com. Rpts.*, No. 129 (1916), pp. 330-338).—A review of some of the criticisms voiced by British importers of American cheese.

Report on the work done during 1913 at the Åvidaberg Dairy Bacteriological Institution (*Nord. Mejeri Tidn.*, 31 (1916), No. 3, pp. 28, 29).—In experiments at this establishment it was found that with *Bacterium glycerini* only 4 cheeses out of 25 gave better results than the control cheese, the rest being similar or poorer. Cheeses in which albumin-dissolving cocci were introduced had excellent consistency. Using *B. curratum* in Herrgård cheese gave a better taste and consistency than in the control cheeses. With *B. glycerini* in household cheese no effect was noticed.

VETERINARY MEDICINE.

Diseases of domestic animals and poultry, their cause, symptoms, and treatment, C. J. and A. W. KORINEK (*Portland, Ore.: Korinek Remedy Co.*, 1915), pp. 192, *figs. 24*).—A popular work.

Tropical medicine and hygiene.—II, Diseases due to the metazoa, C. W. DANIELS (*London: John Bale, Sons & Danicson, Ltd.*, 1914, pt. 2, 2. ed., pp. VIII+278, *pl. 1, figs. 107*).—A revised edition of part 2, previously noted (*E. S. R.*, 24, p. 479), including a chapter on snakes, by A. Alcock (pp. 219-269).

Veterinary handbook and visiting list, T. B. ROGERS (*Philadelphia and London: J. B. Lippincott Co.*, 1916, pp. 119+[96]).—This pocket handbook is planned to bring together the information needed for ready reference by the practicing veterinarian (pp. 1-110). Ninety-six blank pages ruled for a visiting list are attached.

Report of the director of the veterinary institute, SOHNS (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië*, 1914, pp. 254-279).—This report contains a tabulated summary of the mallein and tuberculin distribution, together with comments on the prevalence of the diseases.

The occurrence and treatment of hemorrhagic septicemia, anthrax, swine fever, trypanosomiasis, piroplasmosis, and tetanus are briefly described. A short review of the veterinary course offered at the institute is included.

Reports of Drs. Veranus A. Moore, Mazryck P. Ravenel, and William T. Sedgwick upon the federal meat inspection (*U. S. Dept. Agr., Office Sec. Cir.* 58 (1916), pp. 10).—This consists of reports submitted by experts outside of this Department, who were requested by the Secretary in July, 1913, to investigate the meat inspection work. Recommendations suggested are included.

Anesthesia and narcosis of animals and birds, F. T. G. HORNAY (*London: Baillière, Tindall & Cox*, 1915, pp. XI+86).—Particular attention is given to anesthesia of the horse and dog.

The effect of chloroform on the factors of coagulation, G. R. MINOT (*Arch. Jour. Physiol.*, 39 (1915), No. 2, pp. 131-138).—"Antithrombin is rendered inactive by chloroform and ether, thus allowing free thrombin if present in an oxalated plasma to clot fibrinogen. Prothrombin is not converted to thrombin by chloroform. Chloroform can precipitate both fibrinogen and prothrombin from an oxalated plasma. Chloroform does not weaken the action of a solution of pure thrombin. Ether does slightly. Antithrombin could not be recovered from chloroform or ether extracts of serum or plasma, unheated or heated to 60° C., and is not exactly identical to antitrypsin or to Doyon's antithrombin. In one chloroform-poisoned rabbit the antithrombin of the blood was decreased below normal."

The antisepic action of substances of the chloramin group, H. D. DAKIN, J. B. COHEN, M. DAUFRENE, and J. KENYON (*Proc. Roy. Soc. (London)*, Ser. B, 89 (1916), No. B 614, pp. 232-251; *abs. in Brit. Med. Jour.*, No. 2889 (1916), p. 388).—"The results of investigations have led to the following deductions:

"Almost all of the substances examined containing the NCl group possess very strong germicidal action. The presence in the molecule of more than one NCl group does not confer any marked increase in germicidal power. . . . The germicidal action of many of these chloramin compounds is molecule for molecule greater than that of sodium hypochlorite. Thus *p*-tolueno sodium sulphochloramid with a molecular weight for the crystallized salt of 201.5 is as active as sodium hypochlorite with a molecular weight of 74. Substitution in the nucleus of aromatic chloramins by Cl, Br, I, CH₃, C₆H₅, or NO₂ groups does not lead to any very great increase in germicidal activity. More commonly there is a moderate diminution.

"The chloramin derivatives of naphthalene and other bicyclic compounds of the sulphochloramid type closely resemble the simpler aromatic chloramins in germicidal action. The few bromamins examined show a slightly lower germicidal action than the corresponding chloramins, but the sodium sulphobromamids are much more active than sodium hypobromite. It is significant that they react much more readily with amino acids and proteins than does sodium hypobromite. Derivatives of proteins prepared by the action of sodium hypochlorite and containing NCl groups are strongly germicidal. Blood serum inhibits their germicidal action to much the same extent as it does with sodium hypochlorite or the aromatic chloramins."

Chloramin, its preparation, properties, and use, H. D. DAKIN, J. B. COHEN and J. KENYON (*Brit. Med. Jour.*, No. 2874 (1916), pp. 169-162).—"This paper deals with the properties, practical uses, preparation and cost, and mode of action of chloramin.

Contribution to the study of immunity, F. D'HERELLE (*Compt. Rend. Acad. Sci. (Paris)*, 162 (1916), No. 15, pp. 570-573).—"Experimental data submitted indicate that micro-organisms killed by certain essential oils, especially oil of mustard, constitute a reliable vaccine capable of producing an immunity in an animal against a disease to which it is naturally susceptible. The organism used in the experiment reported was *Bacillus typhi murium*. A single injection of the vaccine was sufficient to confer an immunity which enabled the animal to resist an inoculation of many times the lethal dose of the virulent organism.

A vaccine was also prepared by killing the micro-organism with quinin hydrochlorid, but its power to confer immunity was only relative.

Quantitative tests on the persistence of chemotherapeutic substances in the blood of man and animals, E. BOECKER (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, *Orig.*, 24 (1915), No. 2, pp. 148-166).—"In the blood of men, rabbits, guinea pigs, and horses, previously injected with salvarsan, a large part of the therapeutic agent was still present after one to two hours, and in the rabbit

very often after 24 hours. Optochin disappeared much more rapidly, but was still present in the guinea-pig serum two hours after an injection. It is indicated that the cellular blood elements may fix optochin to a certain degree and later release it. Formaldehyde and "rhodaform" could not be determined in the blood shortly after injection, nor could the latter be found in the bile. It is concluded that such experimental results indicate the best methods of administering therapeutic agents and the varied action of such substances in different animal species.

Further observations on the action of chemotherapeutic substances in vitro. O. SCHREINANN (*Ztschr. Immunitätsf. u. Exptl. Ther., I, Orig., 23 (1915), No. 2, pp. 167-187*).—Salvarsan and optochin were found to be active in bouillon as well as in the serum and blood of different animals, not only in preventing the growth of the organisms but also as bactericidal agents. The inhibition of growth, however, was found to be more regular and to be valuable in determining the selective action of such substances on various organisms. The use of serum and blood of various species often yielded widely different results.

Glanders bacilli were markedly influenced by salvarsan in *in vitro* experiments.

The curative doses in animal experiments which alone influenced infections were such as not only prevented growth but were also sufficient for killing the micro-organisms. This difference of rapidity of action *in vivo* and *in vitro* is attributed to the slow action of the therapeutic substance and to its greatly diminished concentration in the blood stream. The results of treatment of chicken cholera infection with quinin as described by Hallenberger (E. S. R., '90, p. 286) could not be corroborated in experiments with chickens and rabbits.

Studies on antileucocytic animals. LIPPMANN (*Ztschr. Immunitätsf. u. Exptl. Ther., I, Orig., 24 (1915), No. 2, pp. 107-122*).—Two papers are presented.

I. The mode of action of antibacterial sera and chemotherapeutic substances.—The experimental data have shown that the intravenous injection of a bacteriolytic serum (Neufeld's pneumococcus serum) may prevent the passage of the disturbing organism into the blood stream of healthy animals. Animals treated with thorium X, however, develop a bacteremia within eight hours. The pneumococcus serum, therefore, only prevents a pneumococcus sepsis in the presence of leucocytes.

Bacteriolytic sera (cholera) show in leucocyte-free animals in the presence of complement the same bacteriolytic action (vibriolysis) in Pfeiffer's experiments as normal animals. For bacteriolysis the leucocytes are apparently of particular importance. Protozoa are also destroyed by chemotherapeutic sera (salvarsan) the same as in normal animals.

Contrary to these results optochin (ethylhydrocuprein) was found not to exert a bacteriolytic action in animals treated with thorium. Optochin thus appears to require the assistance of the entire organism for its effective action.

II. Contribution to the recognition of natural immunity against swine erysipelas.—In guinea pigs injected with swine erysipelas whose leucocytes had been destroyed by thorium X the pathogenic organisms could not be established bacteriologically, while all the normal animals died from a severe bacteremia.

It is suggested that such curative action is due to the liberation of bactericidal substances (leukins) from the dissolved leucocytes, just as the cholera vibriolysis in Pfeiffer's experiment is accelerated through the liberation of leucocyte substance by treatment with thorium.

The biological significance of unsaturated fatty acids. J. W. JORLING and W. F. PETERSEN (*Ztschr. Immunitätsf. u. Exptl. Ther., I, Orig., 24 (1915), No. 3, pp. 292-310*).—It is shown that through the removal of the antiferment of the

antigen a greater toxicity is bestowed on the antigen, and that an increase of the antifermen titer in sensitized animals is associated with an increased resistance against anaphylactic shock.

Bacterial antifermen ts are thought to consist of unsaturated lipoids of the organisms, and the absolute resistance of intact organisms probably depends on a potential lipoid envelopment. Microchemical analysis revealed no increase of nonprecipitable substances during bacteriolysis.

Complement and serum protease are not deemed identical.

The presence of protease was established in the serum of the guinea pig and rabbit. It was active in weakly acid and in alkaline solutions. Its action was markedly retarded at 56° C. and completely inhibited at 70°, was retarded by unsaturated soaps, and was nonspecific.

It is indicated that the Abderhalden reaction is accompanied by an adsorption of serum and a ferment. Specific tissue is not cleaved in the reaction, but the cleavage products originate from the serum proteins.

In the treatment of pathological cases with potassium iodid there is a constant lowering of the antitryptic titer by which the proteolytic ferment of the organism become more active. It is deemed possible that the therapeutic action of potassium iodid depends on this lowering of antifermen t content.

On the serological action of boiled and unboiled milk and milk proteins. A. VERSSELL (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, *Orig.*, 24 (1915), No. 3, pp. 267-291).—Complement-fixation tests with human, cow's, and goat's milk have shown that human milk antisera react with cow's milk and, to a slight extent, with goat's milk. Cow's milk antisera also react with human milk. In a similar manner cow's milk casein antisera and heated cows' milk antisera react with human milk casein and boiled human milk. Contrary to this, there is no reaction between human serum antisera and cow or goat serum, or between cow serum antisera and human serum. The antisera obtained by the injection of milk serum and the casein react much stronger with the whole milk than with the respective constituents used for immunization. Whole milk and milk serum antisera, even in very small quantities, cause complement deviation with the blood serum of homologous animals. The casein and heated milk antisera do not cause this deviation. Antisera obtained by the injection of boiled milk and the constituents of boiled milk showed, in general, a weaker reaction than those obtained by the injection of the raw milk and its constituents.

Of the individual constituents of milk, the milk serum shows specific characteristics as does blood serum. The animal specificity of the casein is not so regular.

It is indicated from the experiments that a specificity of milk may be considered in the sense of "organ specificity," which is principally attributable to the casein content.

The formation of specific proteolytic ferment in response to introduction of placenta, FLORENCE HULTON (*Jour. Biol. Chem.*, 25 (1916), No. 2, pp. 227-230).—Placental protein is not digested to any greater degree by the serum of an animal sensitized to placenta than by the normal serum. The digestive power of the serum of an animal sensitized to placenta is not increased for casein, Bence-Jones protein, phaeolin, edestin, soy-bean globulin, or milk albumin. Casein is digested to a marked degree by the normal serum, and in most cases the normal serum possesses the more marked activity. Prothrombin is digested to a marked degree in both cases, the injected animal showing increased activity. Gladin is not digested to any great extent by the normal serum, but is by the serum of the injected animal. In general, it may be said

that the injection of placenta does not increase the general or call forth the specific proteoclastic ferment of the blood."

See also a previous note (E. S. R., 35, p. 179).

The Wassermann reaction in rabbits after injection with luetic liver extracts, H. EIKEN (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, *Orig.*, 24 (1915), No. 2, pp. 188-198).—The injection of aqueous extracts or emulsions of luetic liver into rabbits yielded positive Wassermann reactions sooner or later, depending on the individuality of the extract. The reaction, in general, disappeared rather rapidly, but could often be obtained months after the injection. The same results were obtained by using an alcoholic extract of an aqueous extract of luetic liver. These results confirm the findings of earlier investigators.

A positive Wassermann reaction could not be obtained, however, by the injection of an alcoholic extract of human heart or an aqueous extract of the liver of nonsyphilitic children.

If the aqueous extracts were passed through a Chamberland filter their antigenic value was greatly reduced.

Some poisonous plants of Idaho (*Idaho Sta. Bul.* 86 (1916), pp. 16, figs. 7).—Brief descriptions are given of some of the more important poisonous plants of Idaho by F. W. Gail and some suggested remedies by A. R. Hahner.

Prevention of losses of live stock from plant poisoning, C. D. MARSH (*U. S. Dept. Agr., Farmers' Bul.* 720 (1916), pp. 10).—This supersedes Farmers' Bulletin 536, previously noted (E. S. R., 29, p. 280). It is pointed out that while something may be accomplished by the application of medical remedies to sick animals the main reliance in reducing losses must be upon careful management of the range and the animals upon it. Such "management should be directed to the destruction of the poisonous plants in some cases; the use of the range when the plants are not poisonous in other cases; the allotment of some ranges to animals not affected by the plants; care in driving live stock and bedding places for sheep; the elimination of fixed driveways; and to 'rotation' in the use of the range."

Acidosis and cotton-seed meal injury, C. A. WELLS and P. V. EWING (*Georgia Sta. Bul.* 119 (1916), pp. 35-64, figs. 2).—An account is given of the performance and results of an investigation conducted at the station during 1914 and 1915, the object of which was to determine the excess of acid-forming over base-forming elements in cotton-seed meal, and whether such excess causes the injury of pigs which have eaten large quantities of the meal.

The literature relating to the subject is first reviewed, in connection with which is given a bibliography of 215 titles. The investigation, which is reported in detail and includes much tabular data, is summarized as follows:

"One hundred gm. of cotton-seed meal contained an excess of acid-forming over base-forming elements equivalent to 8.21 cc. normal acid. A 30 to 40 day lethal dose of the cotton-seed meal was found to be 25 gm. of meal per kilogram live weight daily for 6-weeks-old pigs, weighing 6 to 10 kg. each, in the type of ration here fed. In feeding cotton-seed meal to ascertain its degree of injury, it seemed necessary to balance the ration, not so much as regards the nutritive ratio, but rather as to the necessary food factors, with some such substance as skim milk. The injury was manifested before death by rather constant abnormal physical and metabolic processes. As much as twice the mineral acid represented by the excess acid in a provisional lethal dose of cotton-seed meal did not injure the pigs, though it produced the metabolic changes characteristic of acidosis.

"Under the influence of cotton-seed meal injury the pigs did not deflect ammonia from urea formation to neutralize any excess acid in the food. The feeding of sodium bicarbonate did not prevent the injury. Addition of ferrous

sulphate retarded the injury. It is concluded that acidosis played only a small part, if any, in the injury produced.

In a restricted ration, such as used in one series, pigs were seriously injured or killed within four to six weeks by eating digester tankage in amounts of nitrogen equivalent to that in a provisional lethal dose of cotton-seed meal, which was approximately 15 gm. nitrogen daily for each pig. This would indicate that, if cotton-seed meal is fed in a restricted ration and in large quantities, the ration may injure and kill pigs, even though it should contain no specific toxic substance."

On the intermediate host of the lung distome, *Paragonimus westermani*, S. YOSHIDA (*Jour. Parasitology*, 2 (1916), No. 3, pp. 111-118, pl. 1).—"In Formosa Nakagawa found the encysted larvae in two fresh-water crabs and experimentally proved that they grew up to the lung distomes. The two crabs were identified by A. Terao as follows: *Potamon (Geothelphusa) obtusipes* [*P. (Geothelphusa) dehaanii*]. Nakagawa added that a fresh-water crab (*Eriophrice japonicus*) will also probably prove to be the intermediate host.

"I have experimentally proved that the encysted larvae of this worm are found in three species of fresh-water crabs from various districts of Japan proper. They are identified as follows: *P. dehaanii*, *Sesarma dehaanii*, and *E. japonicus*."

Are sarcosporidia aberrant forms of cnidosporidia of invertebrates? B. GALLI-VALERIO (*Jour. Parasitology*, 2 (1916), No. 3, pp. 126-128).—"The observations of Piana and Galli-Valerio to the effect that spores of sarcosporidia produce amebic bodies in cultures more closely relate the sarcosporidia to the cnidosporidia. If true that sarcosporidia are only aberrant forms of neosporidia of invertebrates, then the hypothesis of Darling becomes more probable."

The preparation of tetanus antitoxin, E. H. RUEDIGER (*Philippine Jour. Sci. Sect. B*, 10 (1915), No. 1, pp. 31-63, figs. 85).—"From the results obtained the authors conclude that "a suitable strain of the bacillus of tetanus will usually produce potent toxin when grown in nearly neutral glucose broth under hydrogen. The acidity of the broth will rise to more than two per cent normal acid, and it should be neutralized with sodium hydrate before it is injected into the horse. Potent tetanus toxin was obtained by the method described by Ivan Hall." By this method the acid is continuously neutralized by the magnesium carbonate present.

"Horses differ greatly in the power of producing tetanus antitoxin." Of eight horses reported on, one produced 150 units, two 300 units, one 350 units, one 400 units, and three 500 or more units of tetanus antitoxin per cubic centimeter of serum. The antitoxin curve reached its highest mark in from six to nine months after the beginning of immunization.

"The injection of large doses of toxin is not indicated. The dosage should be such that the horse does not appreciably lose in weight."

The conjunctival tuberculin reaction, BESNOIR and CUILLÉ (*Rec. Gén. M. Vét.*, 25 (1916), No. 289, pp. 9-17, fig. 1).—"The authors have found the conjunctival tuberculin reaction for the detection of bovine tuberculosis of great diagnostic value and equal to the classical subcutaneous reaction. The technique is simple and rapid and has the advantage of not causing great rises in temperature. The possibilities of diagnostic error are considerably reduced. The procedure is valuable both in investigational and in practical routine work. The authors believe that it should be substituted for the subcutaneous method, the latter being reserved exclusively for the control of uncertain cases.

Note on the stage of *Piroplasma bigeminum* which occurs in the cattle tick, *Margaropus annulatus*, H. CRAWLEY (*Jour. Parasitology*, 2 (1915), No. 2, pp. 87-92, fig. 1).—A parasitic protozoan was found in smears made from female cattle ticks (*M. annulatus*) and from crushed eggs which they had deposited. The parasite has the form of a minute polycystid gregarine, and is believed to represent the stage of *P. bigeminum* occurring in the tick. It is essentially like the form figured and described by Koch as present in engorged female ticks and their eggs, and also like the form of *P. canis* found by Christophers in *Rhipicephalus sanguineus*. In the present case, it is of interest to note that the female ticks in which the parasites were found showed an unusual mortality, suggesting that the parasite is pathogenic for the tick as well as for the cow. In addition to the gregarinoid parasite a spirochete was found in the ticks. This parasite, not heretofore reported from the United States, is perhaps the same as the form known as *Spirochata theilicri*."

Roundworms in poultry, life history and control, W. B. HERMS and J. R. BESCH (*California Sta. Circ.* 150 (1916), pp. 7, figs. 3).—A series of control experiments with *Ascaris infelix* was conducted by the junior author in order to test the value of certain anthelmintics and other remedies, such as powdered areca nut, powdered pomegranate root bark, turpentine, gasoline, iron sulphate, and tobacco. These were given both alone and in various combinations in the form of pills or mixed with food.

Tobacco stems when finely chopped, steeped in water for two hours, and the stems and liquid mixed with the mash were readily eaten by the fowls and gave uniformly good results. The fowls which were very badly infested with roundworms were in most instances entirely freed from these parasites after two doses.

The tobacco treatment, disinfection of yards, method of handling brooder chicks, and other precautions are described.

RURAL ENGINEERING.

State rivers and water supply commission, ninth annual report 1913-14 (*Victoria Rivers and Water Supply Com. Ann. Rpt.*, 9 (1914), pp. 40, figs. 2).—This report the activities and expenditures of the commission for 1913-14, on irrigation works especially.

Report of the Water Rights Branch, Department of Lands, for the year ended December 31, 1915, W. Youngh (*Rpt. Water Rights Branch Dept. Lands, Brit. Columbia, 1915*, pp. F 56, figs. 8).—This report for 1915 embodies a brief analysis of the work of the branch, including matters touched on in the report for the preceding year. The report of the board of investigation is also included.

Accounting and business procedure as applied to the construction of large irrigation projects, C. E. BEE (*Engin. and Contract*, 45 (1916), No. 12, pp. 269-274, figs. 25).—This article "gives a more or less complete description of the general business procedure, with the accompanying forms, suitable to the accounting of a large irrigation or hydro-electric project. All forms and suggestions are the result or outgrowth of experience. The general plan outlined is at now in use by the U. S. Reclamation Service on construction work."

Ochoco project and Crooked River investigations, J. T. WHISTLER and J. H. LEWIS (*Grey, Cooper, Work, Dept. Int. U. S. Reclamation Serv. 1915, June*, pp. 1, pls. 29).—This report, prepared in cooperation with the State of Oregon, deals with the irrigation and water power possibilities of Crooked River basin and its relation to the lower Deschutes River power development. The features of which this report has special reference are as follows:

"(1) The Ochoco project, which will provide irrigation for 15,500 acres in the vicinity of Prineville, by storage of 40,000 acre-feet in a proposed reservoir on Ochoco Creek, 6 miles above Prineville, the spillway for which will be 113 feet above low water. The estimated cost of this project is \$51.30 per acre.

"(2) The irrigation of part of the north unit lands of the Deschutes project by storage on Crooked River at the Post Reservoir site. Several alternative plans are considered, comprising a low-line development to irrigate 35,000 acres near Haystack Butte, and 9,000 acres near Prineville, with 50 miles of main canal, and water by storage through the construction of a 131-ft. dam above Post at a cost of \$78 per acre; a high-line development for Haystack Butte lands, and all of Ochoco project lands at a cost of \$83 per acre.

"(3) A study of the availability of Crooked River storage for increasing the minimum flow of lower Deschutes River for various hydro-electric power developments proposed in U. S. Geological Survey Water-Supply Paper 344 (E. S. R., 32, p. 279). A fall of 200 to 300 ft. in lower Deschutes River must be developed before Crooked River storage at its estimated cost becomes feasible for this purpose. . . .

"A duty for water of 1.55 acre-feet per acre of irrigable land is considered reasonable for the Ochoco project on the assumption that at least one-third of the project will be in grains. . . . It is estimated that the mean runoff from Ochoco Creek is about 48,000 acre-feet, with an extreme maximum and minimum of approximately 84,000 and 22,000 acre-feet during the past 10 years. . . . Soil and agricultural surveys of irrigable lands show the soil to be from 2 to 4 ft. or more in depth, with the physical character for irrigation and cultivation good. The plant food content of the bench lands is fair and for the bottom lands excellent. . . . It is estimated that during the period 1907 to 1915, inclusive, the mean annual run-off of Crooked River at Post was approximately 216,000 acre-feet, with a maximum of nearly 350,000 acre-feet and a minimum of 125,000 acre-feet."

Irrigation pumping by electric power, G. D. LONGMUIR (*Jour. Electricity* 36 (1916), No. 14, pp. 259-261).—This is a record of electric irrigation pumping in the Columbia River Valley giving comparative costs from representative plants picked at random from 110 plants with a concentrated load of over 700 horsepower. It is shown "that the plants operating as one unit secured a total of 33 in. of water for 70 acres at a total cost of \$7.35 per acre against the individual operations of 35 in. per acre at a total combined cost of \$11.30."

Electric irrigation pumping in Idaho, W. T. WALLACE (*Jour. Electricity* 36 (1916), Nos. 12, pp. 227-230; 13, pp. 241-243).—After tracing the recent increase in irrigation pumping, the author reviews the results of recent surveys conducted by power companies, wherein it was found that plant efficiency rather than power rates was the most important factor in power costs.

Test made of model weir, B. D. MOSES (*Engin. Rec.*, 73 (1916), No. 15, p. 487, figs. 4).—Laboratory investigations made at the University of California on a model reduced 7:1 of the so-called Dolgeville model weir calibrated at Cornell University and described in Water Supply Paper 200 of the U. S. Geological Survey (E. S. R., 19, p. 385) are reported.

It was found that above heads of 1.4 ft. on the Cornell model (0.2 ft. on the California model) the curves for the coefficient c were of the same general type and that the coefficient for the smaller weir was greater than that for the larger. The results of this and further comparisons are thought to furnish encouragement as to the reliability of deductions from small-sized weirs.

Durability of concrete drain tile, O. B. WINTER and H. H. MUSSelman (*Michigan Sta. Spec. Bul.* 75 (1915), pp. 3-13, figs. 4).—Field and laboratory tests of concrete tile are reported.

When apparently sound tile were so placed for four months as to be exposed to the action of the elements, to the action of water in a river bed to determine the effect a large amount of water coming in contact with the surface, and to the action of sewage by placing them in the discharge waters at a sewer outlet, no effect of the exposures was observed. When porous tile were placed in soil and water caused to percolate through their walls no disintegration was observed, but analyses of the water showed that some of the cement had been dissolved.

To show the effect of soil water upon the cement in concrete tile porous cups were prepared from pure quartz sand and cement and different solutions caused to pass through their structure. The results obtained are taken to indicate that "any solution percolating through concrete tile will dissolve some of the cement; in other words, some of the material which is necessary to maintain the tile structure intact, and point conclusively to the necessity for an impervious tile wall structure. Experiments also showed that solutions would percolate through incompletely hardened tile much more rapidly than through tile that had been properly and completely hardened; so the action of solutions upon partially hardened concrete tile is greater than upon those which have been properly hardened. . . . Conclusions reached from these preliminary experiments seem to point to the following as the most important factors for consideration in manufacturing concrete tile to fulfill desired requirements:

"(1) A Portland cement, meeting the requirements of the standard specifications for Portland cement of the American Society for Testing Materials, as revised to date. (2) Clean and preferably siliceous sand, graded in size from the finer particles to those which will just pass a $\frac{1}{2}$ -in. mesh screen, for all tile 10 in. and less in diameter. (3) Proper and accurate proportioning of the cement and sand. The method of measuring materials should be one which will insure separate and uniform proportions of each of the materials at all times. (4) Thorough mixing of materials, preferably by a power-operated batch mixer, and continuing for at least one minute after all materials, including water, are in the mixer. (5) Using a machine that accomplishes thorough packing of materials at proper consistency. (6) All other conditions of manufacture having been as outlined, hardening in a properly equipped and heated steam room will produce tile of the highest grade. When, however, hardening by water vapor is not possible, tile must be kept constantly wet on the surface by sprinkling with water for not less than seven days under favorable weather conditions, and longer during cold weather."

Details of these factors are discussed together with samples of concrete tile received which had failed.

Ground water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook areas, Connecticut. H. E. GREGORY and A. J. ELLIS (*U. S. Geol. Survey, Water-Supply Paper 374 (1916)*, pp. 159, pls. 13, figs. 10).—This is a report on the origin, occurrence, distribution, and quality of the ground waters of five typical areas in Connecticut, with reference to their use for irrigation, farm domestic water supplies, and municipal water supplies.

Surface water supply of Ohio River basin, 1914 (*U. S. Geol. Survey, Water-Supply Paper 388 (1916)*, pp. 125+XXXII, pls. 2).—This report, prepared in cooperation with the States of West Virginia and Illinois, presents the results of measurements of flow made on streams in the Ohio River basin during 1914.

The underground and surface water supplies of Wisconsin. S. WEIDMAN and A. R. SCHULZ (*Wis. Geol. and Nat. Hist. Survey Bul. 35 (1915)*, Econ. Ser. B, pp. XXII+664, pls. 5, figs. 72).—This report, prepared in cooperation with the U. S. Geological Survey, deals with the general conditions affecting Wis-

consin water supplies and their chemical quality and describes local water supplies by counties. The first part covers the geography and geology, conditions controlling underground and artesian water, the flowing artesian wells of Wisconsin, prospecting for flowing wells, springs, and mineral waters, the general composition and uses of water supplies, chemical quality and factors affecting the mineralization of underground water supplies, and surface water supplies and their chemical quality.

Bacteria in commercial bottled waters, MAUD M. OBST (U. S. Dept. Agr. Bul. 369 (1916), pp. 13).—Bacteriological examinations of bottled waters from 110 domestic springs are reported and discussed.

From the results obtained it is concluded that "bottled water for table use should either be actually sterile or should comply with a strict standard as to the number of *Escherichia coli* tolerated. No water should be permitted to be sold which is contaminated at the source in any manner. Inspection of springs and bottling establishments, together with the analysis of official samples, indicates that ignorance of proper precautions, carelessness, and neglect are fully as large factors in the contaminations found as are impurities actually present in the springs.

"The numbers of *E. coli* in official samples collected in the market may be safely assumed to be less rather than greater than the numbers in the freshly bottled stock. The data . . . show the need of improvement in the bacteriological condition of many of the brands of bottled water to be found in the market. Careful consideration of cases to which special study has been given shows that there are some springs used for the production of commercial bottled waters which should not be so used. It is evident that the presence of serious and unremovable contamination should shut the water of a spring permanently from the market. . . .

"The results clearly show that bottled waters can be made to conform to the requirements of the U. S. Public Health Service for drinking water furnished upon trains; that is, that not more than one 10-cc. sample out of five should show the presence of *E. coli*."

Study of the purification of water by aluminum sulphate, A. A. Basso and V. J. BERNAL (Bol. Obras Pùb. Argentina, 12 (1915), No. 4-6, pp. 175-222, pls. 4).—Experiments on the purification of the La Plata River water with aluminum sulphate led to the conclusion that the formula $A=2 (p-5)$ for determining the quantity of aluminum sulphate necessary for the purification of river water gives results which are unnecessarily high. In this formula A =the necessary quantity in milligrams of aluminum sulphate and p =the milligrams of calcium carbonate in the water. It is further concluded that owing to the complexity of the factors affecting the action of the coagulant it is impossible to determine exactly the quantity of aluminum sulphate necessary for thorough purification. The necessary quantity of aluminum sulphate is considered to depend on the alkalinity of the water, the organic matter content, and the matter in suspension. It is also concluded that the precipitated aluminum hydrate adsorbs organic matter in solution.

The filtering action of soil on water containing colloids, K. SACK (Gesellst. Ingen., 38 (1915), Nos. 46, pp. 525-528; 47, pp. 538-543, fig. 1, 48, pp. 549-553).—Studies on the colloidal content of samples of several types of sewage at colloid-holding waters, including domestic and industrial sewage and sewage from septic and settling tanks, and experiments on the filtering and purification action of a crystalline powder composed of the important constituents of all cultural soil, and of moor and humus soil containing much organic matter, heavy and weak loam soils, and light sand soil, are reported. The method Marc for colloid determination was used.

The sewage of small cities was found to contain the maximum amount of colloids about noon, while purely domestic sewage contained more colloids in the morning. The colloid content comprised from one-third to one-half of the total organic content. An exchange of organic sewage colloids with inorganic colloids of the filtering material was established. It was found that the soils were able to adsorb considerably weaker colloids than the crystalline powder. Colloid adsorption by soils was effected not only by their crystalline constituents but also by their amorphous constituents. By washing out the soils with water the salts were first removed and then the colloids. The greatest part of the soil colloids was found to be of an inorganic nature, even in the moor and humus soils.

The soils adsorbed organic colloids before inorganic colloids and exchanged inorganic soil colloids for the organic putrefactive sewage colloids, so that considerably more organic colloids were fixed by the soil than their theoretical adsorptive powers indicated. Freezing and drying of soils strongly increased their peptonizing powers, especially soils rich in humus.

The colloids fixed on the surfaces of soil particles in their turn adsorbed molecularly dissolved substances whereby a more extensive power of adsorption of the soil for colloids was reached.

These results are taken to indicate that the colloid adsorbing properties of soils are the primary factors in the purification of sewage by soils, and that they act in connection with the secondary purification processes involving catalytic and bacteriological influences through the agencies of which adsorbed organic colloids are decomposed and mineralized. Further experiments along this line are in progress.

Stream pollution and sewage disposal in Illinois with reference to public policy and legislation, L. K. SHERMAN (*Ill. Rivers and Lakes Com. Bul. 16* (1915), pp. 30).—This report deals with stream pollution and sewage treatment and reviews the laws governing stream pollution of Illinois and other States.

Second annual report of the engineer of the Oregon State Highway Commission for the year ended November 30, 1915, E. I. CANTINE (*Ann. Rpt. Oregon, Oregon Highway Com.*, 2 (1915), pp. 90, pl. 1, figs. 16).—This report gives construction and expenditures in Oregon for the year ended November 30, 1915, as conducted by the engineer of the state highway commission.

Road maintenance in the several States (*Municipal Jour.*, 40 (1916), No. 14, p. 455-479, figs. 3).—The reports of 20 state highway commissioners, engineers, and other officials are given, describing the methods most successfully employed by each in maintaining the roads of his State, together with a statement of opinion concerning the importance of road maintenance.

Maintenance of Indiana highways, G. E. MARTIN (*Purdue Univ., Dept. Engin., Highway Bul. 1* (1915), No. 1, pp. 24, figs. 10).—The purpose of this bulletin is to present the best current practice in road maintenance operations, with special reference to the roads of Indiana. It is stated that part of the material was drawn from publications of the Office of Public Roads of the U. S. Department of Agriculture.

Economics of highway engineering, L. I. HEWES (*Cornell Cir. Engin.*, 24 (1915), No. 6, pp. 237-246).—The author discusses road administration, finance, traffic, and cost comparison for different types of surfaces, with reference to their bearing on highway engineering economy.

Construction field books for bituminous macadam highways, J. T. CRAWFORD (*Good Roads*, 49 (1916), No. 14, pp. 163-166, figs. 4).—Construction field books, the objects of which are to show the highway as planned, staked, and constructed, are described and illustrated, including a grade book, culvert book, course book, and a bituminous material book. A book for the engineer

In charge contains summaries of all items entering into the construction of the highway.

What the highway engineer should know about bituminous materials, P. HUBBARD (*Cornell Civ. Engin.*, 24 (1916), No. 6, pp. 260-278).—In outlining in a general way what the highway engineer should know about bituminous materials, the author deals with the classification of bituminous materials, refining processes, petroleums, asphalts, tars, physical and chemical tests of bituminous road and paving materials, and specifications.

Road and concrete materials, H. S. MATTIMORE (*Cornell Civ. Engin.*, 24 (1916), No. 6, pp. 280-293, figs. 3).—This article deals with methods of stone, gravel, and slag testing; discusses the proportioning and inspection of concrete materials; and gives tables of tests of limestone, dolomite, sandstone, quartzite, syenite, and trap from different parts of the State of New York. The results of compression tests of sand mortars and diagrams showing the effect of fine sand in concrete, the effect of tamping and moisture content, avoid determination in sand, and the importance of screening sand are also given.

Revised practice on road building (*Cement Era*, 14 (1916), No. 3, pp. 64-67).—The principles adopted by the Second National Conference on Concrete Road Building as representing good practice in the construction of concrete roads and pavements are given. These include sections on materials, drainage, grading, subgrade, forms, pavement section, joints, mixing and placing concrete, retempering, protection and curing, opening to traffic, one-course pavement, and integral curb.

Useful feet-miles conversion table for highway engineers (*Engin. Rec.*, 3 (1916), No. 15, p. 482).—A table of figures computed for Connecticut state highway work is given.

An unusual application of the rattler test for paving bricks, F. L. ROMY (*Engin. and Contract.*, 45 (1916), No. 14, p. 323, figs. 2).—Rattler tests of partly worn paving brick blocks, using angular and spherical shots, showed abnormally high losses not only in percentage but in actual weight. "It appeared, therefore, that the blocks had a fairly hard exterior but a rather soft interior."

Drainage and preparation of subgrades, J. H. HUNZER (*Cornell Civ. Engin.* 24 (1916), No. 6, pp. 277-254).—The author reviews highway drainage in general, taking up more especially underdrainage, foundation courses, culverts and preparation of subgrades. "In the design of the drainage system of any highway, it is necessary that a survey be made by walking over it on foot and all drainage conditions noted. The best time to do this is at the time of the spring run-off and after the new grade line has been approximately fixed."

Reinforced-concrete construction.—III, Bridges and culverts, G. A. BOO and F. C. THIESSEN (*New York and London: McGraw-Hill Book Co.*, 1916, vol. 3, pp. XXII+688, pls. 7, figs. 569).—This is volume 3 of this series (E. S. R. 31, p. 186) and deals with bridges and culverts. It is divided into eight parts.

Part 1, on arch bridges, contains the following chapters: General data, deflection of curved beams, analysis of the symmetrical arch by the elastic theory, design of an earth-filled arch bridge, use of influence lines in arch analysis, symmetrical arches, arches with elastic piers, arch analysis by the method of the ellipse of elasticity, details of arch bridges, construction of arch bridges, three-hinged arches, and patents. Part 2, on slab and girder bridges, contains chapters on slab bridges, simple girder bridges, continuous girder bridges, cantilever bridges, and reinforced concrete in steel bridge construction. Part 3, on culverts, deals with factors in culvert design, pipe culverts, box culverts, and arc culverts. Part 4, by A. W. Ransome, contains notes on the construction plan.

part 5, by L. H. Allen, contains notes on estimating; part 6, by W. J. Titus, deals with the artistic design of concrete bridges; part 7, by A. M. Wolf, deals with the construction in detail of several types of concrete bridges; and part 8, by P. Aylett and P. J. Markmann, deals with European concrete bridges.

How the Forest Service bridges the more remote stream crossings (*Engin. Rec.*, 73 (1916), No. 15, pp. 485, 486, figs. 4).—Methods of difficult but inexpensive construction as adopted by the Forest Service of the U. S. Department of Agriculture in bridging mountain streams of the Northwest are briefly described and illustrated.

Keeping the engine in good running order, C. V. HULL (*Gas Power*, 13 (1916), No. 9, pp. 30, 32, 64, 66).—Suggestions are given on the care of the valve system and the timing of valves on farm gas engines.

[Repair of gas engines], J. F. HOBART (*Gas Power*, 13 (1916), No. 9, pp. 54, 56, 58, fig. 1).—Information on the proper use of set screws is given.

Directory and specifications of gasoline and oil farm tractors (*Farm Machinery*, No. 1277 (1916), pp. 18-20, 25).—This directory contains specifications for 176 tractors of 98 different makes.

Directory and specifications of plows for tractor use (*Farm Machinery*, No. 1277 (1916), pp. 26, 27).—This directory contains specifications for 82 plows of 18 different makes.

The development and efficient utilization of animal, steam, electric, and internal-combustion motor plows, A. WOLFF (*Beiträge zur Entwicklung und wirtschaftlichen Verwendbarkeit von Gespann-, Dampf-, Elektro- und Explosions-motorpflügen. Inaug. Diss., Univ. Giessen, 1913*, pp. VII+96).—This report deals with the development of horse-drawn plows, steam, electrical, and motor plows, the extent to which the use of each is justified on the basis of efficiency, the relation of the cost of mechanical to animal work, and of the cost of motor to steam plowing. It is pointed out that in Germany deep plowing may be more cheaply done with mechanical than with animal power; that in such work the mechanical power works a great saving in expensive animal power, and that more actual work is accomplished per unit of time.

How to plow a field with a tractor, R. OLSEY (*Gas Power*, 13 (1916), No. 9, pp. 10, 12, figs. 8).—This is an illustrated description of what is considered the best method of laying out a field for plowing with a tractor.

Lighting farm buildings, J. L. MOWRY (*Univ. Minn., Dept. Agr., Ext. Bul.*, 5 (1915), pp. 8, figs. 7).—This pamphlet describes and diagrammatically illustrates small oil, acetylene gas, and electric lighting systems for farm buildings.

A simple ice precooling plant, MARY E. PENNINGTON (*Proc. Amer. Warehouses' Assoc.*, 25 (1915), pp. 266-272, fig. 1).—A simple ice precooling plant designed and tested by the Bureau of Chemistry of the U. S. Department of Agriculture is described and illustrated.

"The experimental box . . . is 22 ft. 2 in. long by 11 ft. 4 in. wide by 8 ft. 9 in. high. The bunker occupies 3 ft. 8 in., leaving the box 7 ft. 6 in. wide in the clear. The wire basket holding the ice is 30 in. wide, inside measurement. The cost of such a box is approximately \$800. The interior of the box was painted and enameled to insure as dry an atmosphere as possible."

Test records are also given.

RURAL ECONOMICS.

Psychic causes of rural migration, E. R. GROVES (*Amer. Jour. Social.*, 21 (1916), No. 5, pp. 623-627).—The author states that "the city furnishes forces of varied and artificial stimuli; the country affords an environment of stimuli in comparison less strong and more uniform. Minds that crave external, quan-

titative stimuli for pleasing experiences are naturally attracted by the city and repelled by the monotony of the country. On the other hand, those who find their supreme mental satisfactions in their interpretation or appreciation of the significant expression of the beauty and lawfulness of nature discover what may be called an environment of qualitative stimulations. The city appeals, therefore, to those who with passive attitude need quantitative, external experiences; the country is a splendid opportunity for those who are fitted to create their mental satisfactions from the active working over of stimuli that appear commonplace to the uninterpreting mind."

Suggestion and city drift. E. R. GROVES (*Rural Manhood*, 7 (1916), No. 2, pp. 47-52).—In this article are discussed the psychic suggestions received by boys and girls on farms from their parents, in school, and from the city itself, that tend to draw the young men and women from the rural districts into the cities and towns.

Government aid and direction in land settlement. E. MEAD (*Fort Collins: Colo. Agr. Col. Ext. Serv.*, 1916, pp. 14).—In this address, delivered at the 1916 session of the Colorado Farmers' Congress, the author describes the methods used in obtaining credit for land settlers in Australia and its adaptability to conditions found in the Western States.

Russian land reform. R. T. ELY (*Amer. Econ. Rev.*, 6 (1916), No. 1, pp. 61-68).—This article consists of a brief description of the significance of the Russian land reform movement and comments by various authors regarding this movement.

A system of rural credits adapted to federal reclamation projects. F. H. SEARS (*Faith, Nov.: Author [1916]*, pp. 31).—This pamphlet contains a brief description of the Water Users' Associations connected with reclamation projects, and of methods that may be used to adapt the Landschaft and Credit Foncier systems to the needs of farmers on these projects. It is pointed out that some system of credit is needed if the reclamation farmers are to be successful, and that the success of our reclamation work depends upon the success of the farmers.

Farmers' need for productive credits amply cared for by present facilities. P. W. GOENEL (*Econ. World*, n. ser., 11 (1916), No. 15, pp. 460-469).—The author has outlined his scheme for providing credit for Kansas farmers, proposing the passage by the state legislature of an enabling act for the organization of one land bank with a capital stock of about \$1,000,000. The bank would be located at the state capitol, and confine its business to the making of loans on farms occupied and cultivated by the owners, either on straight payment or upon the amortization plan.

Management of sandy-land farms in northern Indiana and southern Michigan. J. A. DRAKE (U. S. Dept. Agr., *Farmers' Bul.* 716 (1916), pp. 2 figs. 3).—This deals with the problems involved in the improvement and management of farms on the sandy-land areas which occur in different parts of northern Indiana, southern Michigan, and in a part of northwestern Ohio. It outlines a plan whereby a man with limited means, by beginning with suitable cash crops, may build up one of these farms and at the same time derive some revenue from it, finally developing a well-balanced farm system.

The normal stages of development suggested for the average sandy-land farm are as follows: (1) Growing and selling cash crops, among which soy beans or cowpeas for seed should have a prominent place; (2) a transition stage, in which live stock should be introduced as rapidly as fences can be purchased and built, and as the farm can be made to produce the necessary feed and pasture; and (3) a general and well-diversified farm system, with the proper balance between cash crops and live stock which will afford profitable

employment for the entire year, maintain crop production in a reasonably high state and yield a suitable labor income.

Farm management for boll-weevil conditions, J. R. FAIR (*Ga. State Col. Agr. Bul. 98 (1915), pp. 15, figs. 4*).—The author outlines two systems of management, one for diversified farming before the coming of the boll weevil, the other for a modification of the plan under boll-weevil conditions.

The farm first outlined is to consist of 200 acres, of which 50 are in pasture, 100 in a 3-year rotation of cotton, corn, and oats followed by cowpeas, and the remainder used for raising corn for silage, soy beans, and peanuts, grazing crops for hogs, a garden, and a small grass plat.

Under boll-weevil conditions, 8 of the $3\frac{1}{2}$ acres previously devoted to cotton remain in cotton, the remainder being used either for corn and velvet beans for cattle, peanuts and soy beans for hogs, Irish and sweet potatoes, or vetch and oats for hay. The remainder of the farm is to be operated as in the first instance.

The author has also outlined a plan for a smaller farm with the same system of management.

Terminal market problems, J. E. BOYLE (*Reprint from Quart. Jour. Univ. S. Dak., 6 (1916), No. 2, pp. 159-167*).—This pamphlet consists principally of excerpts from government documents regarding terminal elevators, produce exchanges, hedging and speculation, grading and dockage, and storing and mixing. A brief bibliography is appended.

Patronage dividends in cooperative grain companies, J. R. HUMPHREY and W. H. KRAMER (*U. S. Dept. Agr. Bul. 371 (1916), pp. 11*).—The authors divide the cooperative grain companies into 5 classes: (1) Regularly incorporated companies; (2) single elevators organized under cooperative law; (3) the county unit plan, a number of elevators belonging to one cooperative association; (4) a similar plan but on a larger scale; and (5) similar to (4) but organized as separate county organizations to secure the benefits of trading on boards of trade.

The authors point out that the dividends may be distributed on the money value of the individual transactions or on the basis of the amount of grain contributed by the individual members.

Methods of handling patronage dividends under the various conditions mentioned above are outlined.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 2 (1916), No. 5, pp. 1-48*).—This number gives the usual monthly estimates of the farm value of the more important agricultural products, and the range of prices at important markets, with detailed statistics concerning the condition on May 1 of winter wheat, rye, hay, spring pasture, spring plowing, and spring planting.

Special reports are included on the strawberry acreage and the percentage of the total harvested each month, apiary conditions, maple sugar and syrup production and prices, the Texas Bermuda onion crop, prices of meat animals, stocks of hay on farms May 1, and yearly summaries of the world's production of important crops.

Statistics of the production of cereals and legumes (*Estadística de la Producción de Cereales y Leguminosas. Madrid: Junta Consult. Agron., 1914, pp. 1-1915, pp. 31*).—These reports continue data previously noted (*E. S. R. 30, 701*).

Proceedings of the conference relative to the marketing of live stock, distribution of meats, and related matters (*U. S. House Representatives, 64th Cong., 1st Sess., Doc. 855 (1916), pp. 152, fig. 1*).—This conference, held at Chicago, November 15 and 16, 1915, under the auspices of the U. S. Department of Agriculture, was called with a view to ascertaining the essential facts and

conditions pertaining to the marketing of live stock, determining the feasibility of improving marketing methods and facilities, and promoting a better understanding among the various interests connected with the industry. The discussion covered the different phases of the production and distribution of live stock and live-stock products, beginning with the live-stock producers and ending with the retail trade.

Statistical information relating to stocks, cotton, grain, provisions, live stock, and seeds, 1915 (*Chicago: Howard, Bartels & Co., 1915, pp. 53*).—In this report are included Chicago's grain inspection rules and the daily movement and prices of agricultural products at Chicago for 1915, together with data showing by comparison the monthly movement for earlier years. Data are also given relative to the crops and trade in the principal foreign countries.

Resources of Nebraska (*Nebr. Dept. Labor Bul. 31 [1916], pp. 167*).—This report contains data showing the mortgages released and filed during the year, the surplus shipments of agricultural produce, and brief topographic notes as to soils by counties.

AGRICULTURAL EDUCATION.

Agricultural education, A. C. MONAHAN and C. H. LANE (*Rpts. Comr. Ed. [U. S.], 1914, I, pp. 291-318; 1915, I, pp. 295-316*).—A review is given of the progress in agricultural education in 1913-14 and 1914-15 in the agricultural colleges and normal, secondary, and elementary schools in the United States, agricultural education at meetings of the year, educational work of the U. S. Department of Agriculture, and the principal developments of agricultural education in other countries.

Agricultural and mechanical colleges (*Rpt. Comr. Ed. [U. S.], 1914, II, pp. 277-317*).—This is a compilation from official sources of statistics of the land-grant colleges with reference to faculties, students, courses of study, value of funds and equipment, revenues, additions to equipment, etc., together with a summary of statistics for the years 1891-2 to 1913-14 and a summary of legislative acts and appropriations in 1914 in various States.

Home economics, HENRIETTA W. CALVIN and CARBIE A. LYFORD (*Rpt. Comr. Ed. [U. S.], 1915, I, pp. 317-333*).—Following a review of the series of its bulletins on Education for the Home, by B. R. Andrews (E. S. R., 33, p. 35) the authors report on home-economics instruction in state colleges, universities, normal schools, summer schools, and public and rural schools, state supervision, state courses of study, textbooks for home-economics teaching, use of apartments or houses in public-school teaching, cafeterias as practice places for home-economics teaching, rural-school luncheons and lessons in food preparation, continuation schools and home economics for adult women, home-economics education for colored students, laws affecting home-economics instruction, home-economics associations, and tendencies and developments in home economics.

Education for the home, B. R. ANDREWS (*Rpt. Comr. Ed. [U. S.], 1914, pp. 319-334*).—This report deals with the subject matter and method in education for the home, the status and program of education for the home, including fundamental principles and the various points in our school system and such organizations in which they find expression, and local progress in education for the home in elementary and high schools, practical household arts work in public schools, vocational classes, normal schools, and colleges.

Education for child nurture and home making outside of schools, MARY SCHUYLER (*Rpt. Comr. Ed. [U. S.], 1914, I, pp. 363-374*).—This is a review of what is being done in the education for child nurture and home making in organizations interested in this work, and of home education extension work of high and normal schools and colleges.

A rural school experiment, S. S. RITTENBEEG (*Clemson Agr. Col. S. C., Ext. Dir. [Pub.]*, 1916, Jan., pp. 24, pls. 8).—This is a report on the first year's work of a plan undertaken as an experiment in Darlington County, S. C., in September, 1914, for the purpose of giving agriculture in rural schools and solving the problem of the lack of competent teachers.

The agricultural instruction in five selected consolidated schools was placed in charge of J. N. Napier. Each school had three acres of land for field crop demonstrations and one acre for orchard work. The preliminary work, weekly program, classroom, field, club, and demonstration work, and the effects of the plan on the pupil, the parents, the educational conditions in the county, and the agriculture of the community at large are discussed.

During the first year the expenses were \$2,500, including the salary, cost of automobile, and traveling expenses of the teacher. This year three agricultural teachers are giving instruction in 14 schools and are receiving a total of \$5,700, including salaries of \$2,500, \$1,800, and \$1,400, respectively, and traveling expenses. At present nearly three-fifths of the total enrollment of boys from the sixth grade upward are being taught practical agriculture. There are now more than 700 boys attending the public schools of the county, and under this method it is thought that five teachers can instruct all these boys in practical agriculture at a cost not exceeding \$10,000 or \$12,000. If the experiment proves successful after a two-year trial it is planned to adopt it throughout the State.

Elementary agricultural instruction (*Agr. Gaz. Canada*, 8 (1916), No. 1, pp. 69-77, figs. 5).—This is a review and forecast of elementary agricultural instruction in the provinces of Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Manitoba, Saskatchewan, Alberta, and British Columbia.

Farm and home management schools and agricultural housekeeping schools (*Ztschr. Landw. Kammer Schlesien*, 19 (1915), Nos. 47, pp. 1245, 1246; 30, pp. 1317, 1318, fig. 1; 51, pp. 1342-1344, fig. 1).—An account is given of the aim and instruction of farm and home management schools and of agricultural housekeeping schools. The former are intended for the daughters of large farm owners and for the training of teachers of home economics for agricultural housekeeping schools and itinerant cookery schools, while the latter are for the daughters of medium and small farmers. Applicants for admission to the former, especially to the seminar courses, must have completed at least a ten-year course at a higher girls' school or must take a special entrance examination, while the completion of the common school is sufficient for admission to the housekeeping schools.

Report of the department of agriculture of Sweden, 1913 (*K. Lantbr. Styr. [S:rederi] Underhållna Ber.* 1913, pp. [10]+648, figs. 2).—This report contains the usual accounts of the various agencies for the promotion of Swedish agriculture, including the work of agricultural, horticultural, dairy, and housekeeping schools and dairy, chemical, and seed-control stations.

Women's work in agriculture in peace and war (*Jour. Bd. Agr.* [London], 22 (1915), No. 9, pp. 859-866).—A review is given of the report of the Agricultural Education Conference on Agricultural Education for Women and of a circular letter to the secretaries of the county war agricultural committees on the employment and training of women, followed by an account of the experience of some farmers who have recently engaged women to take the place of men who have enlisted.

The Agricultural Education Conference finds that (1) the instruction available in England for women consists of courses in men's institutions which admit women students, and additional short courses or classes for women

which are attached to institutions for men; (2) that the amount of instruction offered to rural women, or young women of the tenant farmer or small-holder class, consisting of itinerant instruction and in a few counties of short courses at a farm school or similar institution, is totally inadequate. Only two of the twelve institutions which may be classed as farm schools attempt to give any practical instruction except in dairying. In the opinion of the conference the itinerant instruction should take the form of organized classes rather than lectures, especially in poultry keeping and horticulture.

The conference recommends that (1) the curriculum provided for girls should include instruction in the care of animals, the minor farm processes, and domestic economy, including fruit bottling and jam making; (2) instruction in home management should be provided for women in any grouped course of agricultural education, as in Ireland, Belgium, and Canada, where instruction in home management forms the central feature of the agricultural education provided for women; and (3) there is room for the provision, at one or more of the collegiate institutions, whether entirely devoted to women or not, of a systematic course in general agriculture comprising both the practical and scientific side, for women of the professional and land-owning classes and the daughters of the larger farmers, whether they intend to become teachers or to take positions involving management.

[*Animal husbandry extension course for boys' and girls' clubs*, C. A. Norcross (*Agr. Ext., Univ. Nev. Buls.*, 1916, Nos. 1, pp. 20, figs. 10; 3, pp. 29, figs. 14).—These bulletins comprise the first six lessons of the course and deal with the three general divisions of cattle, viz, dairy, dual-purpose, and beef cattle, including a study of the origin of cattle, the development by breeding of the three distinct types, history and characteristics of the leading breeds of each, farm and range management, and judging cattle.

Arithmetic problems based upon agricultural club work (*N. C. Agr. Ext. Serv. Circ. 8* (1916), pp. 10-15).—This is a series of 50 problems in arithmetic based on corn, pig, and poultry club work and prepared for supplementary work in rural schools.

MISCELLANEOUS.

Twenty-eighth Annual Report of Louisiana Stations, 1915, W. R. Dousou (*Louisiana Sta. Rpt. 1915*, pp. 32).—This contains the organization list, a report by the director discussing the work of the stations, an account of their progress including brief departmental reports, and a financial statement as to the federal funds for the fiscal year ended June 30, 1915, and as to the state funds for the fiscal year ended November 30, 1915. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-third Annual Report of Minnesota Station, 1915 (*Minnesota Sta. Rpt. 1915*, pp. 74).—This contains the organization list, a financial statement for the federal funds for the fiscal year ended June 30, 1915, and for the state funds for the fiscal year ended July 31, 1915, and a report of the director summarizing the work of the station and its substations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta. West. Wash. Sta. Mo. Bul.*, 4 (1916), No. 2, pp. 15, figs. 12).—This number contains brief articles on the following subjects: The Root Maggot Pest, by E. B. Stookey; Plant Good Potato Seed, by J. L. Stahl; Field Corn in Western Washington, by E. B. Stookey (see p. 339); Teaching the Young Stock to Roost, by Mr. and Mrs. G. R. Shoup (see p. 377); and Preserving Eggs, by W. R. McBride.

NOTES.

Alabama College.—A state appropriation of \$100 per annum for the years 1915 to 1918, inclusive, is now available for each county that raises a similar sum to be used for prizes, premiums, and other phases of boys' and girls' club work. These funds are spent under the joint supervision of the state board of agriculture and the county authorities, under plans and rules submitted by the professor of school agriculture of the college. The club work for boys in each county is also under the general supervision of the county farm demonstration agent and that for girls under the supervision of the county canning club agent.

Alaska Stations.—C. C. Georges, agronomist in charge, received the degree of D. Sc. from his Alma Mater, the Michigan College, at its recent commencement.

Delaware College.—Gifts have been made to the college from an unannounced donor during the past year amounting to \$1,000,000, and are being utilized largely for buildings. In addition to those previously noted, Wolf Hall, named in honor of Dr. Theodore R. Wolf, who for over a quarter of a century was professor of chemistry, is now in course of construction. This building is intended primarily to house all the activities of the agricultural department, but for a time will also furnish quarters for general chemistry and biology. It will cost, partially equipped, \$280,000. A new dormitory for men will also be started shortly to accommodate about 75 students.

Florida University and Station.—Dr. J. E. Turlington, superintendent of the Craven County Farm Life School, of Vanceboro, N. C., has been appointed professor of agronomy, vice W. C. Etheridge resigned to become professor of farm crops in the University of Missouri. John Bellings, assistant horticulturist and editor of the station, resigned July 1.

Georgia College.—A cooperative arrangement has been made with the Office of Public Roads and Rural Engineering of this Department, whereby J. V. Phillips of that Office will be given headquarters at the college. M. D. Wood has been appointed instructor in animal husbandry and Dr. J. E. Severlin, instructor in veterinary medicine.

Hawaii Federal Station.—C. W. Carpenter, of the Office of Cotton and Truck Disease Investigations of this Department, was transferred June 1 to the position of plant pathologist in charge of the new division of plant pathology.

Kentucky University.—Beginning with the new academic year, a one-year course in practical agriculture is to be offered. No entrance examinations are to be required or restrictions made as to age.

The boys' pig club work, begun in 1915, has now been extended to 40 counties with a membership of 1,250. Bankers, business men, and farmers have cooperated in the enterprise by distributing over \$5,000 worth of pure-bred pigs among the members.

Massachusetts College and Station.—A special commission, consisting of the state supervisor of administration, the state commissioner of education, and

three additional members selected by the Governor, was authorized by the last legislature to investigate the general subject of agricultural education at the college and the development of the agricultural resources of the Commonwealth. This commission was directed to study and report before January 10, 1917, on the policy of the college, its use of the funds at its disposal, the advisability of further expenditures for buildings, lands, etc., the relation of the college to other agricultural institutions in the State, and similar questions. An appropriation of \$7,500 was made for holding hearings and other expenses. Governor McCall has subsequently announced as his appointments to the commission, Dr. L. Clark Seelye, ex-president of Smith College, William F. Whiting, a paper manufacturer of Holyoke, and Warren C. Jewett, for many years secretary of the State Grange.

The department of botany has been reorganized with A. V. Osmund in charge. Beginning September 1, Orton L. Clark, assistant plant physiologist, will devote part time to instruction work, and Dr. P. J. Anderson, associate professor of botany, will give part time to the station as associate plant pathologist.

W. A. Allen and T. L. Harrocks have been appointed assistant chemists, the former in the fertilizer section and the latter in the feed and dairy sections. C. L. Beals has been assigned to chemical work in nutrition. George L. Farley, superintendent of schools in Brockton, has been appointed supervisor of junior extension work, this dealing with the boys' and girls' clubs and similar activities.

Mississippi College and Station.—W. C. Trotter, of Winona, and J. S. Howerton of Baldwyn, have succeeded E. M. Clark and T. W. Carter, as members of the board of trustees.

Minnesota University and Station.—R. W. Thatcher has been appointed assistant director of the station.

The division of agricultural chemistry has been reorganized as the division of agricultural biochemistry, and will provide for instruction and research in plant chemistry, biochemistry, cereal technology, and methods of agricultural chemical analysis. Dr. R. A. Gortner has been appointed associate professor of biochemical research and associate agricultural biochemist of the station, and George E. Holm research assistant in agricultural biochemistry.

The work relating to animal production has been organized into an animal industry group, which includes the divisions of animal husbandry, dairy husbandry, poultry husbandry, animal nutrition, and veterinary science. Dr. C. W. Gay, professor of animal husbandry in the veterinary college of the University of Pennsylvania, has been appointed professor of animal husbandry and animal husbandman, and will be chairman of the group and of the animal husbandry division. H. H. Kildree, professor of animal husbandry and assistant chief of dairy husbandry in the Iowa College and Station, has been appointed professor of dairy stock and production and chairman of the dairy husbandry division.

Missouri University and Station.—Hereafter all dairy products used by the university are to be purchased or manufactured by the department of dairy husbandry. This policy is adopted to insure pure dairy products for use in the various university dormitories and incidentally makes it possible for more complete instruction to be given by the department.

The Iowa College conferred the honorary degree of D. Sc. on C. H. Eekles at its last commencement.

The resignations have been accepted of C. B. Hutchison as professor of forage crops, J. G. Watson as extension assistant professor of dairy husbandry, M. A. R. Kelley as instructor in agricultural engineering, and B. E. Sive as assistant in agricultural chemistry. Recent appointments include E. W. Lehmann, assistant professor of agricultural engineering at the Iowa College, as associate professor.

of agricultural engineering; **A. C. Ragsdale**, instructor in dairy husbandry at the West Virginia University, as extension assistant professor of dairy husbandry; **W. A. Albrecht** as instructor in soils; **R. A. Kinnaird**, instructor in agriculture at the Maryville State Normal School, as extension instructor in soils; **H. G. Newman** as assistant in veterinary science; **P. H. Ross**, county agricultural agent of Leavenworth County, Kans., as county agent leader; **Harry T. Bennett** as assistant in agricultural chemistry; **Dr. E. H. Bullock** as assistant in the agricultural extension service; and **J. H. H. Mote** as district agricultural agent in the Ozark region.

Montana College and Station.—Resignations are noted of **G. E. Smith** as assistant chemist, effective August 1, and **D. C. Wood**, as assistant professor and assistant in farm management, effective September 1, the latter to accept a position as extension professor of farm management in the University of Missouri.

Nebraska University and Station.—The erection of the agricultural engineering building has been postponed on account of the present high cost of construction. Bids for erecting this building have twice been advertised for and refused. It is probable that another effort will be made to secure bids about March, 1917.

Frank C. Dean has resigned as agricultural editor to accept a similar position in the Ohio State University, effective September 1.

Nevada Station.—The collection has been begun of certain lupines poisonous to live stock for the purpose of extracting the poisonous principle and studying its chemical nature. A new line of work planned is a study of methods of avoiding the heavy losses now experienced in bringing sheep through the period of spring starvation when they are coming from the winter ranges of the southern deserts to the lambing grounds in the northern portion of the State.

Rutgers College.—**Alva Agee**, director of the division of extension in agriculture and home economics and professor of soil fertility, has been appointed secretary of the new state board of agriculture. **John H. Hankinson** has been appointed state leader in farm demonstrations and **Alexis L. Clark** has resigned as assistant state leader.

Cornell University and Station.—The state fiscal year has been changed to end June 30 instead of September 30 so that it now coincides with that of the Federal Government. This is proving to be of great convenience to the college of agriculture, particularly in the administration of its projects under the Smith-Lever Act.

A. R. Mann, formerly secretary of the college of agriculture, has been appointed acting dean and director beginning August 1.

The summer session of the forestry school was attended by about 30 seniors and graduate students as compared with about 20 the previous year. The program included practical woods work in the neighborhood of Lake Saratoga, where because of the nearness of fairly large centers of population there is a close utilization of forest products and a type of lumbering different from that studied in the Adirondacks in 1915. **G. H. Collingwood** has been appointed extension professor of forestry, vice **R. D. Moody** resigned to become a member of the Wisconsin conservation commission.

Clinton DeWitt Smith, instructor in extension teaching and widely known as an educator in both North and South America, died at Buffalo, N. Y., August 5, while on a lecture tour for the college of agriculture. Professor Smith was born at Trumansburg, March 7, 1854, was graduated from the university in 1873, and taught in the Star Military Institute and practiced law for brief periods. He became assistant agriculturist in the station in 1890, director of the Arkansas Station in 1891, and director of the Minnesota Station and professor of dairy

husbandry from 1891-1893. In the latter year he went to the Michigan College as professor of agriculture, continuing in this position until 1899. In 1895 he was also made director of the Michigan Station, and in 1899, dean of the department of special courses and superintendent of farmers' institutes. In 1908 he accepted the presidency of the Louis Queiros School of Agriculture of São Paulo, Brazil, returning to this country after a five-year period of service in 1913. His subsequent life was spent on his farm at Trumansburg and in the extension service of the college of agriculture.

New York State Station.—John C. Baker, Ph. D. (Columbia, 1916), has been appointed associate chemist. William W. Baer has been appointed assistant chemist for work in the agronomy department, succeeding E. J. Lewis resigned to engage in commercial work.

Ohio Station.—Recent appointments include Wayne Van Pelt as assistant in botany, W. C. Gangloff as assistant in chemistry, and H. J. Conlin as assistant in soils. C. E. Mangels, assistant in agricultural chemistry at the Missouri University and Station, has been appointed assistant in nutrition beginning September 1, succeeding Chas. M. Fritz resigned.

Oregon College and Station.—Farmers' days have recently been held at the Moro dry-farming substation and the Eastern Oregon substation near Umatilla. The institutions were opened to inspection and the leading experimental work was explained to hundreds of farmers.

A West-side Farmers' Week was conducted by the college extension service at McMinnville, July 3 to 8, with more than 1,000 farmers and their wives in attendance.

Gilbert B. Posey, research assistant in botany, has been appointed scientific assistant in forest pathology in this Department.

Porto Rico Insular Station.—During the past year experimental plantings have been made of pineapples, vegetables, grapefruit, and other economic plants. About 300 tons of seed cane were distributed and the station has about 1,000 seedlings under test. Excellent results are reported by planters with D-117 and B-208.

Work with citrus diseases, analyses of tropical fruits, and a citrus survey are being begun. About 8,700 packages of plants, 5,000 of fruits, and 100 of seed were inspected under the plant quarantine. An appropriation of \$1,000 was made by the Porto Rican legislature for the construction of a plant house.

George N. Wolcott has resigned as assistant entomologist to complete Ph. D. work at the University of Illinois.

Tennessee University.—C. Elmer Wylle has been appointed assistant in dairying beginning June 15.

Utah College and Station.—The station office building has been thoroughly renovated and the station library rearranged to make its material more readily accessible. The mailing service for all publications of the institution, including those of the college, station, and extension division, has been reorganized to promote efficiency in sending out printed matter. A conference of the agronomy workers of the eleven Rocky Mountain and Pacific Slope States was held at the college July 18-20.

N. L. Butt, fellow in agronomy, has been appointed assistant agronomist and H. P. Anderson assistant chemist and bacteriologist. Other appointments in the station include Orson P. Madsen as assistant poultryman, vice A. D. Egbert resigned; N. E. Edlefsen as assistant meteorologist; and W. J. Merrill as secretary to the director. George Stewart and H. R. Hagan, instructors in agronomy and entomology, respectively, have been granted leaves of absence for the ensuing year to pursue graduate work in Cornell and Harvard universities.

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